ON THE SOCIAL AND PSYCHOLOGICAL DETERMINANTS OF COOPERATIVE AND RISK-TAKING BEHAVIOR

A Dissertation

by

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ABSTRACT

This dissertation examines some of the social and psychological factors affecting individual cooperative and risk-taking behavior. Specifically, laboratory experiments were conducted in order to shed more light on the interactive forces affecting individual contributions to public goods and individual giving in dictator game settings. Moreover, biometrics data were utilized to provide a stronger understanding of the true effect of positive and negative moods on risk preferences.

First, the interaction between high- and low-income individuals in voluntary contributions mechanisms is examined by varying group composition and marginal-per-capita-return. A finite mixture model is used to split each income type into two categories. While *free-riders* were present among both income types, the majority of low-income individuals were classified as *opportunists*, who strategically increased their contributions in the presence of high-income individuals in order to benefit from their resources. On the other hand, high-income individuals were predominantly *selfists*, who deliberately decreased their contributions in the presence of the low-income type due mainly to self-interest and caution.

Next, the perception of social norms as a first impulse or last resort is investigated in the context of individual giving in dictator games. Three variants of the dictator game are used, which differed in the way the dictator roles were assigned. By creating an environment where role assignment was random but open for interpretation, it was found that social norms compliance is not impulsively sought by individuals. Rather, adherence to social norms is only observed when the environment does not allow for an interpretation that can be used to break the prevalent norm.

Finally, facial expression analysis is used to provide a more accurate assessment of the effect of positive and negative mood on risk preferences. A *dilution effect* issue was uncovered, which is inherent in the conventional experimental design used for tackling this question. The results served to address a controversy over the direction of the effect of mood on risk preference, showing that both positive and negative mood acted to decrease risk-aversion. Finally, the importance of the risk preference elicitation method used in this type of research was demonstrated.

DEDICATION

Dedicated to my dear parents,

Knowledge really does achieve miracles! But the road to success is paved with sacrifice…

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CHAPTER I

INTRODUCTION

The individual decision-making process is a complex engine that combines – and is influenced by – several psychological and environmental inputs. With the advent of behavioral economics, we now understand how limited our definition of "rational decision-maker" was, and how much it suffered when translated to real-world behavior. We now realize the need to adopt a more flexible definition of "rational decision-maker" and to construct refined models that can accommodate a wider spectrum of behavioral responses to different economic settings.

Understanding how individuals make choices, and what factors affect their preferences for different actions and alternatives, is crucial in every society. This knowledge forms the basis through which valuable policy recommendations can be extended to help guide interventions designed to improve people's lives and increase the general level of welfare in the community. Behavioral economics offers a venue through which we can help individuals make better decisions, help producers increase their efficiency and profitability, and help policy-makers implement more effective intervention programs.

The surge in experimental and behavioral research in the past decades has uncovered an undeniable common ground between individual psychology and decision making. It has also demonstrated the need for a broader perspective when studying individual behavior. To this end, this dissertation is intended to take one step further in this direction by investigating the social and psychological determinants of cooperative and risk-taking behavior. Moreover, it incorporates recent developments in the field of experimental and behavioral economics by utilizing biometric data to address a longstanding controversy related to the effect of mood on risk preferences. The objectives herein are summarized below:

1. Investigate the interaction between high- and low-income individuals in voluntary contributions mechanisms and examine behavioral changes driven by differences in the perceived benefit from the public good.
2. Refine the behavioral model related to the role of social norms in individual giving behavior, hence, providing a deeper understanding of the way individuals interact with and are affected by social norms when deciding how much to give to others.
3. Utilize biometrics data, mainly facial expression analysis technology to assess emotions, to provide a more accurate assessment of the underlying effect of positive and negative moods on risk preferences and uncover a major issue with the conventional experimental designs used for studying the role of mood on individual behavior.

Laboratory experiments were used to address the above three points in chapters I, II, and III respectively. This is followed by a conclusion section, which highlights the main findings and contributions from this work.

CHAPTER II

SELF SERVING MOTIVATIONS OF HIGH- AND LOW-INCOME INDIVIDUALS IN VOLUNTARY CONTRIBUTIONS MECHANISMS

2.1 Introduction

Public goods are an integral part of any society. They are very important to us as consumers since we use them on an almost daily basis. They are also important to policy-makers, who are regularly confronted with questions regarding which public good to provide and how to finance it. Finally, they are especially important to producers, and one of the most important examples that motivates this chapter are generic advertising programs, where a complete industry join together to collectively finance generic advertisements that are aimed at increasing the overall demand for their commodity. Of course, it is clear that generic advertising is in nature a public good, since all the producers of a certain commodity would contribute to those advertisements and would later reap the benefits of the resulting increase in the demand for their product. In fact, it is estimated that every $1 invested in generic advertisements leads to an average of $3-$6 in additional revenue (Messer, 2008).

Tremendous amounts of money are spent by the government every year on public goods in general and generic advertising in particular. According to the congressional budget office, the U.S. government spends around $500 billion annually on public goods. More than $1 billion of this budget is allocated to generic advertising alone. For instance, $47 million is spent every year on generic advertising for cheese, $45 million on beef, $24 million on Florida orange juice, $15 million on cotton, and $14 million on pork (Brester and Schroeder, 1995; Williams et al., 2004; Kaiser et al., 1994; Forker, 1988).

Regarding the question of how to finance public goods, the two predominant methods are mandatory contribution mechanisms (MCMs) and voluntary contribution mechanisms (VCMs). Clearly, as the names imply, MCMs depend on a specific policy that forces everyone to contribute to public goods, while VCMs rely on individuals voluntarily paying money into an account to help finance the public good. Despite several arguments in favor of the effectiveness of MCMs, the carry many disadvantages. For example, they are considered rigid, costly, and in the particular case of generic advertising were ruled as unconstitutional by the federal appeals court (Messer, 2008; Ward, 2010). The failure of generic advertising under MCMs was driven by a public outcry from both larger and smaller producers to appeal to the supreme court against this mechanism (Messer et al., 2004). While larger producers claimed the costs of forced investments to be triple the cost they incur in advertising their own brands, small producers argued against paying relatively high advertising costs considering their size in the industry (Messer et al. 2004, Crespi, 2003; Crespi and McEowen, 2006). On the other hand, VCMs are potentially convenient and despite prominent free-riding tendencies in those mechanisms, there is ample laboratory and real-world evidence of significant contributions in VCM. This fact has shifted interest towards determining the main motivations that drive voluntary contributions to public goods (Andreoni, 1995; Sugden, 1984; Andreoni, 1990; Fehr and Gachter, 2002; Palfrey and Prisbrey, 1997; Anderson et al., 1998; Keser and van Winden, 2000). To this end, this paper investigates the behavior in VCMs of individuals with heterogeneous incomes grouped separately and in mixed groups with homogeneous and heterogeneous relative returns from the public good. This investigation explains the interaction between higher- and lower-income individuals (or large and small producers in the case of generic advertising) and changes in their behavior resulting from different expectations regarding their relative gain from the provision of the public good.

The predominant models in the literature explain giving in public goods games to be a result of social preferences, namely altruism, warm glow, inequality aversion, and reciprocity (Bolton and Ockenfels, 2000; Andreoni, 1989; Becker, 1974; Sugden, 1984). The first model, altruism, argues that individuals derive utility from the consumption of others (Becker, 1974; Andreoni, 1989; Andreoni, 1990; Levine, 1998). Warm glow is somewhat related to altruism, except that it is more concerned with the utility realized from the very act of giving (Kahneman and Knetsch, 1992; Andreoni, 1990; Andreoni, 1995). On the other hand, inequality aversion assumes a fair individual who dislikes inequalities in income and/or consumption (Bolton and Ockenfelds, 2000; Fehr and Schmidt, 1999; Ashley et al., 2010), while reciprocity perceives fairness as the reciprocal action of mirroring the behavior of others (Sugden, 1984; Fischbacher, 2001; Croson, 2007).

The vast experimental research on VCMs has identified several other factors that affect levels of contribution to public goods. For instance, Isaac et al. (1994) reported that group size is directly proportional to contribution levels. It was also found that contributions might be a result of confusion (Andreoni, 1995), are enhanced by the presence of institutions (Kosfeld et al., 2009) and altruistic punishment (Fehr and Gatcher, 2002), and are influenced by the particular framing of the task (Andreoni, 1995; Park, 2000).

Few papers have already considered the effect of income heterogeneity on contributions in VCMs. In fact, the effect of income heterogeneity has been examined using linear (Kachelmeier and Shehata ,1997; Isaac and Walker, 1988; Buckley and Croson, 2006) and nonlinear (Bergstrom et al., 1986; Chan et al., 1996; Chan et al., 1999) public goods settings.[1] In a linear public goods

[1] We only discuss literature pertaining to linear public goods here since it is pertinent to the paper. A review of some of the literature on nonlinear public goods is provided in Buckley and Croson (2006)

setting, Kachelmeier and Shehata (1997) and Isaac and Walker (1988) studied the effects of monitoring and communication, respectively, on contributions using heterogeneous incomes. However, these papers do not separately report the contributions across different income levels. Buckley and Croson (2006) addressed this issue by conducting an experiment where they used two endowment levels (25 and 50 tokens). By constructing mixed groups, consisting of two members from each endowment level, they show that less wealthy individuals contribute the same as the wealthier in absolute terms, which of course translates to a higher percentage contribution by the less wealthy.

Heterogeneous relative returns, or marginal per capita returns (MPCR), have been theoretically investigated by Kinateder and Merlino (2017), who considered heterogeneity in cost and valuation in settings with endogenous networks. Experimental applications of this heterogeneity have been conducted by Isaac and Walker (1988), Fisher et al. (1995), and Cardenas et al. (2002). They all report a negative correlation between MPCR and contribution levels. However, while Isaac and Walker (1988) and Fisher et al. (1995) varied MPCR by changing the return from the public good, variations in MPCR were introduced in Cardenas et al. (2002) by changing the valuations of the private good.

In this paper, we combine heterogeneity in income and MPCR in order to gain a better understanding of the interactive effects of those two factors. Unlike Buckley and Croson (2006), high- and low-income individuals were placed in separated and mixed income groups. Heterogeneity in MPCR was introduced in the mixed income groups, which consisted of two low- and two high-income individuals. Specifically, three types of mixed income groups were constructed: 1) homogeneous MPCR; 2) increasing MPCR with income, where high-income individuals benefited more from the public good; and 3) decreasing MPCR with income, where low-income individuals benefited more from the public good. The comparison of separated income groups with mixed income, homogeneous MPCR groups will help us determine any changes in behavior resulting from the mere presence of high- or low-income members in the group. Moreover, the cross comparison of mixed income groups with each other and with separated income groups will shed light on how differences in the relative return of high- and low-income individuals from the public good affect their contributions. Analyzing those effects could potentially reveal some of the determining forces that shape contributions in those settings and some of the characteristics of the underlying individuals.

We find a significant increase in the average contributions of low-income individuals when high-income individuals are present, even when the public good bears the same benefit to all members (i.e., the mere presence of high-income individuals causes low-income individuals to contribute more to the public good). On the other hand, there is a significant decline in average contributions of high-income individuals when low-income individuals are present, even when the public good bears the same benefit to all members (i.e., the mere presence of low-income individuals causes high-income individuals to contribute less to the public good). Moreover, while there is evidence of *free-riding* behavior under both income levels, the percentage of high-income *free-riders* is significantly lower than the percentage of low-income *free-riders*. Our framework was analyzed using a finite mixture model with different types of low- and high-income individuals. Low-income individuals were classified as either "*free-riders*" or "*opportunists*" (who strategically increase their contributions in the presence of high-income individuals in order to encourage higher contributions and gain access to the resources of high-income members). As for high-income individuals, they were classified as either "*free-riders*" or "*selfists*" (who, due to self-centered interests, deliberately decrease their contributions in situations where low-income individuals are present and/or are in advantageous positions). Finally, a tremble parameter was used to account for the possibility of mistakes and/or loss of concentration, thus allowing for a less rigid definition of *free-riders*.

The significance of this paper stems from its high applicability in the real-world and its role in providing policy makers a deeper understanding of the interaction between high- and low-income individuals and the dominant motivations determining their behavior towards public good provision. When considering generic advertising for example, it is unreasonable to view producers as identical in income and/or the perceived benefit from the public good. In fact, this is one of the main issues raised by different types of producers when fighting mandatory contribution programs to generic advertisements. Small producers claim to be disadvantaged by this rigid mechanism, arguing that being forced to pay a specific amount of money leaves them at a disadvantage relative to larger producers (Zheng et al., 2010; Hamilton et al., 2009). On the other hand, while larger producers have advocated expansions in generic advertising programs, they too argue against mandatory programs (Forker, 1988). Hence, by constructing simplified environments to study the interaction of high- and low-income individuals in this setting, we can provide a better understanding of the behavior of larger and smaller producers under a voluntary mechanism, which will in turn enable us to investigate ways that can enhance this interaction and generate higher returns to all members.

The rest of the paper is organized as follows: the experimental design and procedures are described in section 2, followed by a simplified theoretical model in section 3, which explains potential behavior of both income types. Section 4 includes the data analysis and a discussion of the main results, while section 5 presents the structural regression model, which was constructed based on observed regularities in the behavior of high- and low-income individuals. The last section briefly summarizes the main findings and concludes the paper.

2.2 Experimental Design

A total of 140 undergraduate students were recruited to participate in the experiment, which consisted of a baseline and three treatment groups. Subjects were paid $5 for their participation plus the amount of any earnings they made during the experiment. Upon arrival to their session, subjects read and signed a consent form, after which they completed the public goods game (which differed based on the treatment), filled a short questionnaire regarding demographic and socioeconomic characteristics, received their payments, and were escorted out of the session.[2]

Subjects were randomly split into high- and low-income types, where each subject participated in twelve rounds of the public goods game (2 practice and 10 real rounds). High-income type individuals were endowed with 750 tokens in each round, while low-income type individuals were endowed with 250 tokens in each round. Participants were divided into groups of four members, where each group played the public goods game separately. In each round, subjects were required to decide how to divide their endowments between two accounts: private and public accounts. Participants were explained that each token allocated to the private account yields 1 cent only to the person who invested it, while each token allocated to the public account yields a return less than one cent to all members of the group.

The return from every token allocated to the public account differed by treatment, as did the group composition. Following each round, each subject was given information regarding their own contribution to the public account, the total contribution of their group to the public account,

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[2] This study was approved by the Institutional Review Board of the University and subjects were told that privacy will be maintained regarding their information and that any data collected will only be used for research purposes. The public goods game and subsequent questionnaire were computerized using z-Tree (Fischbacher 2007).

their earnings from the private and public accounts, and their total earnings for the round. One of the ten real rounds was randomly selected as binding at the end of the experiment and subjects were paid according to their earnings in this binding round. The two practice rounds, along with various examples on how the private and public accounts work, were included in order to avoid confusion and to make sure that everyone had a good understanding of the procedure.

The instructions made it clear to the participants that the group members will remain anonymous to one another throughout the entire experiment and that at no point will the identity of any of the group members be revealed to the other members of the group. In order to avoid changes in behavior from reputation effects, a stranger design was implemented in which the participants were randomly reassigned to new groups each round. Moreover, subjects had an understanding that their investment decisions will be completely confidential, as will their earnings from each round.

The high- and low-income types played independent of each other in the baseline group, hereafter "*separated groups, homogeneous return*" (SHR). That is, each four-member group was entirely made up of either high-income or low-income individuals. Subjects were aware that each member in their group received the same number of tokens in each round (250 for low-income or 750 for high-income individuals). Also, within each group, every token that any member invests in the public account yielded half a cent to each member of the group (i.e., the MPCR was 0.5 for all members in the baseline treatment).

In the other three treatments, the high- and low-income types were mixed together in the same group, where each group was made up of two high-income and two low-income individuals. The participants were aware that the group members had different endowments, but they were not given information on the individual endowments of each member in the group. However, they knew their own endowment and the average endowment of the group (including them), which was 500 tokens in all cases. Hence, they were able to classify themselves as belonging to the high- or low-income types.

The first treatment, hereafter "*mixed groups, homogenous return"* (MHR), was identical to the baseline treatment in that the MPCR was equal to 0.5 for all members. The only difference was the group composition. In the second treatment, "*mixed groups, increasing return*" (MIR) the MPCR was directly proportional to the initial endowment, meaning that high-income individuals benefited more than low-income individuals from every token invested in the public account. The participants were clearly explained that their return from every token that any of their group members invests in the public account is positively related to their endowments. The instructions also specified the individual MPCR, which was equal to 0.75 for high-income individuals and 0.25 for low-income individuals. Finally, in the third treatment, "*mixed groups, decreasing return*" (MDR), the MCPR was inversely proportional to the initial endowment, meaning that low-income individuals benefited more than high-income individuals from every token invested in the public account. Again, this was clearly explained to the subjects and they were given their individual MPCR, which was 0.25 for high-income individuals and 0.75 for low income individuals. Table 1 summarizes the main parameters in each treatment.

Table 1. Summary of Treatments

Treatment	Group Composition	MPCR
Separated Groups, Homogenous Return (SHR)	4 high-income or 4 low-income	0.5¢ for all members
Mixed Groups, Homogenous Return (MHR)	2 high-income and 2 low-income	0.5¢ for all members
Mixed Groups, Increasing Return (MIR)	2 high-income and 2 low-income	0.25¢ for low- and 0.75¢ for high-income
Mixed Groups, Decreasing Return (MDR)	2 high-income and 2 low-income	0.75¢ for low- and 0.25¢ for high-income

2.3 Theoretical Framework

This section presents the main theoretical framework that explains potential changes in the behavior of high- and low-income individuals when heterogeneities in income and relative returns are introduced. The model presented here will be based on the well-established evidence of positive contributions to public goods and on the fact that individual contributions are positively correlated with group average contributions (Bardsley 2000; Fischbacher and Gatcher 2010). By incorporating those elements, we can write the payoff individual i realizes from the VCM in the following form:

$$u_i = (w_i - g_i) + ag_i + a\sum_{j=1}^{3} g_j(\bar{g}) \tag{1}$$

where w_i is the initial endowment for individual i, g_i is his/her contribution to the public account, a is the MPCR, the first term on the right-hand side represents the payoff from the amount he/she places in the private good, the second term is his/her payoff from own contribution to the public good, and the third term is his/her payoff from the contributions of other members to the public good. The dependency of individual contributions on group average contributions is captured by writing g_j as a function of $\bar{g}$, thus assuming that individual i is aware of, or alternatively believes in, this proportional relationship when deciding how much to invest in the public account. The positive correlation is captured by the assumption $\frac{\partial g_j}{\partial \bar{g}} > 0$.

Following this framework, we can represent the payoff of a low-income individual playing in a separated income group by:

$$u_i^P = (w_i^P - g_i^P) + ag_i^P + a\sum_{j=1}^{3} g_j^P(\bar{g}). \tag{2}$$

On the other hand, his/her payoff when playing in a mixed income group is given by:

$$v_i^P = (w_i^P - g_i^P) + a g_i^P + a\delta g_j^P(\bar{g}) + a\gamma \sum_{k=1}^{2} g_k^R(\bar{g}) \tag{3}$$

where δ and γ are reaction factor parameters, which capture how the low- and high-income individuals react to the general presence of members from the opposite income type. The idea behind those parameters is that, *ceteris paribus*, individuals might choose to change their general behavior in a public goods game merely because they find themselves playing with individuals from a different income class. For instance, the presence of high-income individuals might increase or decrease the low-income type's general aptitude for giving compared to what they would have done when playing in a separated income group. Over the course of the game, it is reasonable to assume that those parameters will depend positively on own MPCR and group average contributions. Hence, we can write the parameters as $\delta(a, \bar{g})$ and $\gamma(a, \bar{g})$, with positive partial derivatives. If high- and low-income individuals are not responsive to the presence of the opposite income type, then γ and δ will take a value of one. On the other hand, if they react positively (negatively) with a general increase (decrease) in contributions, then γ and δ will be greater (less) than one.

Given this structure, we can consider the three possible behavioral changes a low-income individual can decide on as a result of playing with individuals from the opposite income type. Relative to what they would have done in a separated income group, low-income individuals can either increase or decrease their contributions or keep them unchanged. We start with the change in payoff resulting from an increase in contributions, which we calculate by assuming the individual contributes g_{oi}^P in the separated income group and g_{Hi}^P in the mixed income group (with $g_{Hi}^P > g_{oi}^P$) and subtracting equation (2) from (3) to get:

$$\Delta u_i^P = \left(g_{oi}^P - g_{Hi}^P\right) + a\left(g_{Hi}^P - g_{oi}^P\right) + a\left[\delta g_j^P(\bar{g}_H) - g_j^P(\bar{g}_o)\right] + a\left[\gamma \sum_{k=1}^{2} g_k^R(\bar{g}_H) - \sum_{l=1}^{2} g_l^P(\bar{g}_o)\right] \quad (4)$$

The first term on the right-hand side is the loss in payoff resulting from the decreased investment in the private account, while the second term is the return resulting from the increased investment in the public account. This is straightforward since increasing one's contributions to the public good necessitates withdrawing that amount from the private account. The third term captures the gain or loss from the change in the behavior of the other low-income individual between separated and mixed income groups. Finally, the fourth term represents the gain or loss resulting from the difference in the contributions of the two remaining high-income individuals in the mixed income group and the two remaining low-income individuals in the separated income group.

Similarly, we can write the change in the payoff of low-income individuals if they decrease their contribution from g_{oi}^P to g_{Li}^P in the mixed income group as:

$$\Delta u_i^P = \left(g_{oi}^P - g_{Li}^P\right) + a\left(g_{Li}^P - g_{oi}^P\right) + a\left[\delta g_j^P(\bar{g}_L) - g_j^P(\bar{g}_o)\right] + a\left[\gamma \sum_{k=1}^{2} g_k^R(\bar{g}_L) - \sum_{l=1}^{2} g_l^P(\bar{g}_o)\right] \quad (5)$$

while the change in their payoff resulting from a no change in contribution can be written as

$$\Delta u_i^P = a\left[\delta g_j^P(\bar{g}_o) - g_j^P(\bar{g}_o)\right] + a\left[\gamma \sum_{k=1}^{2} g_k^R(\bar{g}_o) - \sum_{l=1}^{2} g_l^P(\bar{g}_o)\right]. \quad (6)$$

A payoff maximizing agent will select the strategy that provides him/her with the most favorable change in outcome. While the sum of the first two terms is clearly negative in equation (4) and positive in equation (5), the outcome of the third and fourth terms depends on how the individual perceives δ and γ. However, it is straightforward to see that those terms are positively correlated with own contribution. Hence, they are higher in equation (4) than (5). This creates the tradeoff that defines the change in behavior. If individuals believe the benefits gained by increasing the contribution from g_{oi}^{P} to g_{Hi}^{P} (the last two terms in equation 4) outweigh the losses realized from the lower payoff generated by their own investments (the first two terms in equation 4) then they are better off increasing contributions in the mixed relative to the separated income group. If the opposite is true, then they are better off decreasing contributions. Finally, if they think the changes offset each other, then they are better off not changing their behavior. Similar logic can be applied to high-income individuals.[3]

Hypothesis 1: *The individual's perception of δ and γ dictates their preferred change in behavior when playing with members from the opposite income type. They will select the strategy that maximizes their payoff.*

Based on this model, we can now investigate the effects of changing the a to understand potential changes in behavior in the treatments with heterogeneous MPCR. Looking at equation (4), we can see that as a increases, the first two terms become less negative (more positive in equation 5) while the third and fourth terms are scaled up. Moreover, considering the experimental

[3] An elaborate discussion of the potential changes in the behavior of a high-income individual is presented in the appendix.

design, we can note that $\delta(a, \bar{g})$ and $\gamma(a, \bar{g})$ move in opposite direction. This is because they are both positively correlated with a, which either increases for low- and decreases for high-income individuals or vice versa. Hence, the change in the individual's behavior when heterogeneity in MPCR is introduced depends on their perception of the potential changes in outcome resulting from alterations in $\delta(a, \bar{g})$ and $\gamma(a, \bar{g})$. This leads us to our second hypothesis.

Hypothesis 2: *Changes in MPCR can stimulate further changes in contribution through their impact on δ and γ.*

2.4 Results and Discussion

A breakdown of average total contributions and average percent contributions by treatment and income type is presented in Figure 1 and Table 2. The average total contributions, and average percent contributions, of low-income individuals are significantly higher in the MHR and MDR compared to the SHR and MIR treatments. In fact, besides the comparison between MHR and MIR, which was marginally significant (t-test, P=0.09), all cross comparisons of MHR and MDR with SHR and MIR were significant at the 95% confidence level (t-test, P<0.05). This is taken as evidence that lower-income individuals contribute more towards the public good when high-income individuals are present and the public good bears equal or more benefit to them. More importantly, the result indicates that the mere presence of high-income individuals causes low-income individuals to increase their contributions to the public good even when MPCR is left unchanged. This kind of behavior might stem from a self-centered interest to maximize one's return. Perhaps this increase in contribution levels in the presence of high-income individuals represents a deliberate attempt by low-income individuals to signal low free-riding tendencies to the high-income type, thus encouraging them to put forward generous contributions to the public good. By pooling in the resources of the high-income type, low-income individuals can increase their overall return by reaping the benefits generated from the public good.

Table 2. Average Contributions and Percent Contributions by Treatment and Endowment Type

Separated Groups, Homogeneous Return (SHR)		
	High-Income	*Low-Income*
Contribution	279.7	104.9
Percent Contribution	0.37	0.42

Mixed Groups, Homogeneous Return (MHR)		
	High-Income	*Low-Income*
Contribution	224.5	124.6
Percent Contribution	0.30	0.50

Mixed Groups, Increasing Return (MIR)		
	High-Income	*Low-Income*
Contribution	424.5	107.8
Percent Contribution	0.57	0.43

Mixed Groups, Decreasing Return (MDR)		
	High-Income	*Low-Income*
Contribution	132.4	131.2
Percent Contribution	0.18	0.52

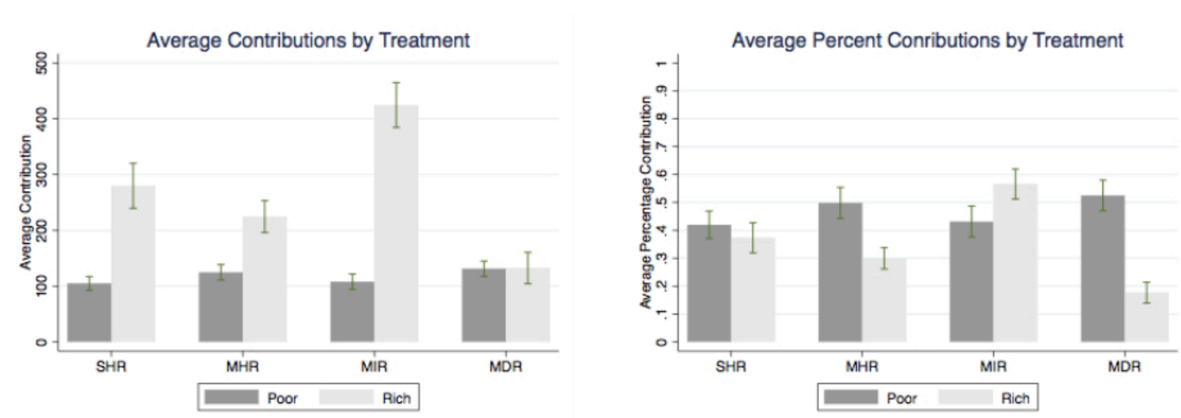

Figure 1. Breakdown of average contributions by treatment and endowment type

Table 3, which presents the payoffs for each treatment and endowment type that would result from the two extreme strategies *FC* and *FR*, adds perspective to this conclusion and helps explain the lack of change in contributions between the SHR and MIR treatments. Here, *FC* refers to the fully cooperative strategy where all members contribute their full endowments to the public good and *FR* refers to the Nash equilibrium strategy where all members free-ride and contribute nothing to the public good. As we can see, the cooperative outcome carries the same return to low-income individuals in the SHR and MIR treatments. It is important to highlight that following our previous reasoning, low-income individuals are only keen on encouraging higher contributions from high-income individuals when the presence of those individuals provides an added benefit that could potentially be realized from the public good. In other words, low-income individuals should only contribute more in the MHR and MDR treatments since the presence of high-income individuals in those two treatments inflates their potential return from the public good to $10 and $15 respectively. This is exactly what we observe in the data.

Table 3. Expected Payoff Summary by Treatment and Endowment Type

Separated Groups, Homogeneous Return (SHR)			Mixed Groups, Homogeneous Return (MHR)		
	FC	*FR*		*FC*	*FR*
Low-Income	$5	$2.5	*Low-Income*	$10	$2.5
High-Income	$15	$7.5	*High-Income*	$10	$7.5
Mixed Groups, Increasing Return (MIR)			**Mixed Groups, Decreasing Return (MDR)**		
	FC	*FR*		*FC*	*FR*
Low-Income	$5	$2.5	*Low-Income*	$15	$2.5
High-Income	$15	$7.5	*High-Income*	$5	$7.5

Notes: FC refers to the strategy where every member in the group contributes all of his/her endowment to the public good and FR is the strategy where every member in the group completely free-rides and contributes nothing to the public good.

For high-income individuals, it is clear that average total contributions, and average percent contributions, are significantly lower in the MHR and MDR compared to the SHR and MIR treatments. In fact, the effects are somewhat more pronounced than those of the low-income type.

Besides the comparison between SHR and MHR, which was significant at the 95% confidence level (t-test, P=0.024), all cross comparisons of MHR and MDR with SHR and MIR were significant at the 99% confidence level (t-test, P=0.000). This result indicates that high-income individuals contribute less towards the public good when low-income individuals are present and the public good bears equal or less benefit to them. More importantly, it implies that the mere presence of low-income individuals causes high-income individuals to decrease their contributions to the public good even when MCRP is left unchanged. This can be explained by a combination of self-centered interest and a precautionary tendency that becomes more prominent in the presence of the low-income type. Again, the payoff matrix for high-income individuals in Table 3 provides more insight to this hypothesis. Under altruism and inequality aversion, it would be expected that high-income individuals would not change or even increase their contributions in the MHR and MDR treatments, since that would benefit low-income individuals and help decrease the earnings gap between the two types. However, the fact that contributions by high-income individuals significantly decreased in those treatments implies that even though altruism and/or inequality aversion might still be operating, they are overshadowed by motivations of self-interest and mistrust.

From the perspective of high-income individuals, the probability of free-riding is higher when the low-income type is present. This is because it is more likely that someone with a low-income would be inclined to free-ride and depend on high-income individuals to contribute to the public good. Therefore, driven by a self-centered interest not to be taken advantage of, high-income individuals decrease their contributions to the public good. The fact that the contribution levels of the high-income type are lowest in the MDR treatment favors self-interest as the dominant force driving the behavior of high-income individuals. Here, the public good carries a bigger reward to low-income individuals, which significantly decreases their free-riding motivations since they have more reason to invest in the public good. Generous contributions by high-income individuals in this treatment can only be explained by altruism and/or inequality aversion, since the high-income type is better off with the *FR* scenario in this case. However, the sharp decrease in average contributions by the high-income type to a mere 18% supports the hypothesis regarding the significance of self-interest and its role as one of the main motivations driving the behavior of the high-income type.

The results are further analyzed for low- and high-income individuals in panels a and b of Figure 2, respectively. The left side of the panels separates percent contribution into 10 categories ranging from 0-100% and shows the fraction of the overall low- and high-income samples in each category. This result is broken down by treatment on the right side of the panels. The clustering of observations in the 0-0.1 interval for both income types under all treatments is indicative of the presence of *free-riding* behavior, at least among some individuals. However, it is also important to note the clustering at the 0.9-1 interval in most cases. For low-income individuals, we observe a slight rightward shift in the histogram of contributions under the MHR and MDR treatments (Kolmogorov-Smirnov test, $P<0.027$). On the other hand, we also observe a leftward shift in the histogram of contributions for high-income individuals under those treatments (Kolmogorov-Smirnov test, $P<0.013$). This further supports the notion concerning the motivations that determine the behavior of low- and high-income individuals in those scenarios.

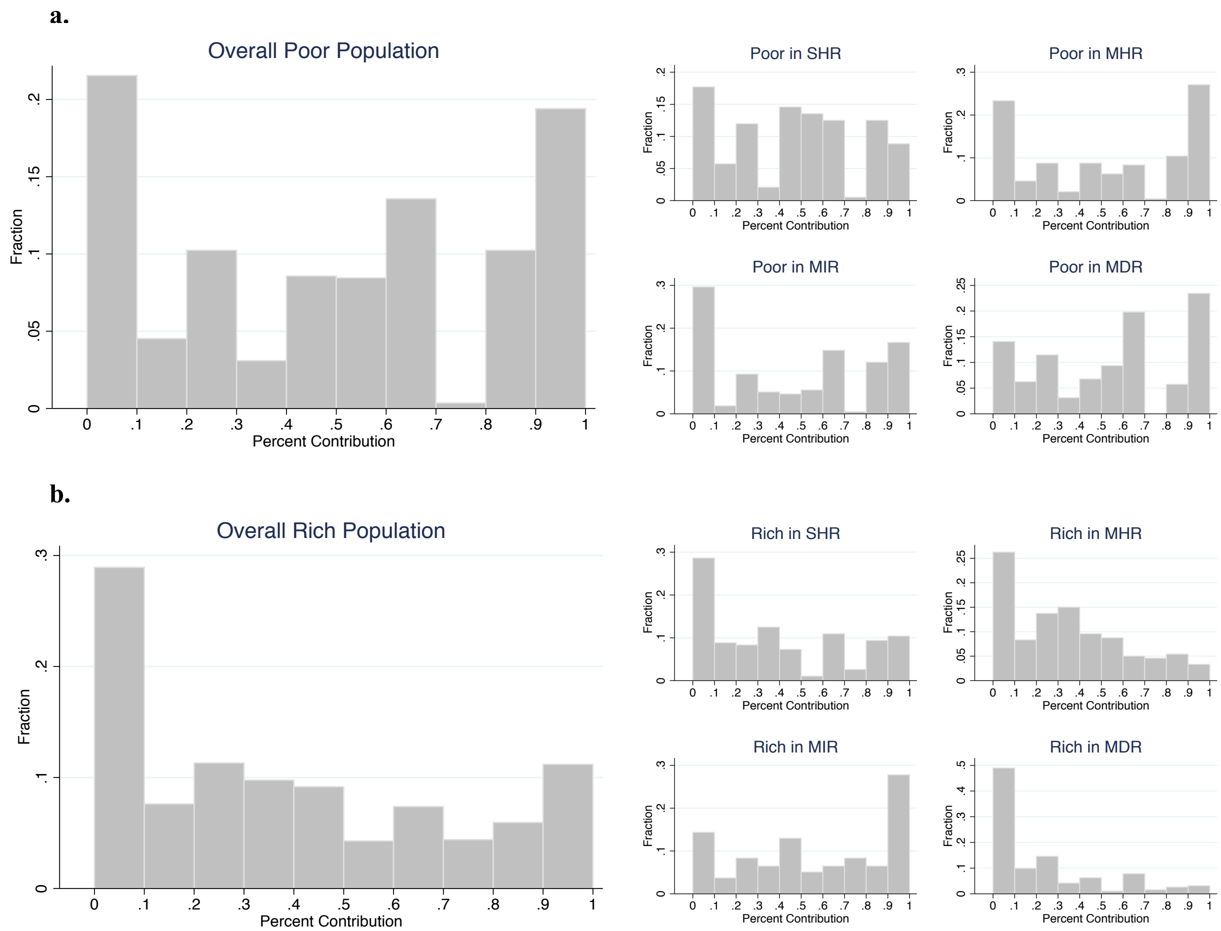

Figure 2. Histograms of percent contribution by treatment and endowment type

The effects of the different treatments on percent contribution were estimated in Table 4 using several Tobit regression specifications in order to ensure robustness of the above results. The specification in column 1 investigates the treatment effects leaving out any other potential explanatory variables. Learning effects are examined in column 2 by including the variable period, which represents the round number, while the demographic effects of gender and school year are controlled for in column 3.

Firstly, our results are consistent with the universal finding in the literature concerning the presence of a learning effect. We observe a significant, albeit small, downward trend across periods as shown by the negative coefficient on the variable period in column 2. More importantly, looking at the treatment effects for high- and low-income individuals, it is clear that the results in Table 4 strongly support our conclusions. Low-income individuals contribute significantly more in the MHR and MDR treatments, while high-income individuals contribute significantly less in those treatments under all specifications. This bolsters our confidence regarding the hypothesized opportunistic and self-centered motivations of low- and high-income individuals respectively. Finally, concerning demographic effects, the results indicate a slightly higher contribution rate among males compared to females and among upper- compared to lower-school year students.

Table 4. Tobit Model Capturing Average Treatment Effects for High- and Low-Income Types

	[1]	[2]	[3]
Variable	Parameter	Parameter	Parameter
Constant	0.398	0.506	0.262
	(0.037)	(0.044)	(0.047)
Rich	-0.073	-0.073	-0.066
	(0.052)	(0.052)	(0.052)
MHR	0.121	0.120	0.081
	(0.050)	(0.050)	(0.041)
MIR	-0.008	-0.007	-0.045
	(0.052)	(0.051)	(0.052)
MDR	0.160	0.160	0.137
	(0.053)	(0.052)	(0.053)
MHR*Rich	-0.197	-0.197	-0.195
	(0.071)	(0.070)	(0.070)
MIR*Rich	0.291	0.290	0.312
	(0.073)	(0.072)	(0.073)
MDR*Rich	-0.407	-0.408	-0.409
	(0.075)	(0.075)	(0.074)
Period	-	-0.020	-
		(0.004)	
Male	-	-	0.049
			(0.026)
School Year	-	-	0.049
			(0.012)
Sigma	0.460	0.456	0.456
	(0.011)	(0.011)	(0.011)
Observations	1,400	1,400	1,400
Log Likelihood	-1068.572	-1058.503	-1057.96

Notes: The data contained a total of 258 left-censored and 175 right-censored observations. Considering the significance of sigma under all specifications, a Tobit regression generates significantly different estimates compared to an OLS regression.

2.5 Finite Mixture Model

The robust findings presented in the previous section allow for the modeling of various types of high- and low-income individuals. Specifically, the high- and low-income types were each classified into two categories based on the observed behavior across treatments.[4] Given the observed clustering of observations on the lower and upper limits, it is appropriate to consider a two-limit censored model, where we define the latent variable y^* as desired contribution. Low-income individuals were modeled as either *"free-riders"* or *"opportunists"*. Although *free-riders* are typically individuals who always contribute zero to the public good, the term was used more loosely here to allow for the possibility of mistakes and/or loss of concentration. Thus, instead of restricting this category to individuals who strictly contribute zero on every occasion, a tremble parameter was used to include individuals who contribute very low amounts on most occasions among *free-riders*. As for *opportunists*, they are defined as individuals who contribute more in the presence of the high-income type, but only when this presence carries potential benefits to them. Hence, while the desired contribution of *free-riders* is consistently near zero and is not related to other variables, the desired contribution of *opportunists* was assumed to depend linearly on a set of explanatory variables as follows:

$$y^*_{opp} = \beta_0 + \beta_1 * RWB + \beta_2 * period + \beta_3 * male + \beta_4 * schoolyr + \varepsilon \qquad (7)$$

Where y^*_{opp} is the desired contribution of *opportunists*, RWB stands for rich-with-benefit and is a dummy variable that takes the value one if the high-income type are present and the situation is

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[4] The model used in this analysis is similar to the one in Bardsley and Moffatt (2007).

beneficial for low-income individuals (i.e., it takes the value one in the MHR and MDR treatments), and $\varepsilon \sim N(0, \sigma^2)$. The other explanatory variables are as described in the previous section and are included for the same reasons they were included in the Tobit regression specifications.

The high-income type was also modeled as belonging to one of two categories, *"free-riders"* and "*selfists*". Here, *selfists* are defined as individuals who contribute less in the presence of low-income individuals, when this presence brings a potential disadvantage to them. Again, the less rigid definition of *free-riders* was adopted here and their desired contribution was assumed not to depend on other variables. On the other hand, the desired contribution of *selfists* was specified linearly as follows:

$$y^*_{slf} = \beta_0 + \beta_1 * PWD + \beta_2 * period + \beta_3 * male + \beta_4 * schoolyr + \varepsilon \qquad (8)$$

Where y^*_{slf} is the desired contribution of *selfists*, PWD stands for poor-with-disadvantage and is a dummy variable that takes the value one if the low-income type are present and the situation is disadvantageous for high-income individuals (i.e., it takes the value one in the MHR and MDR treatments), and $\varepsilon \sim N(0, \sigma^2)$.

While the latent variable y^* can take any value on the real numbers line, the observed actual contribution y is restricted to values within the allowable range $[0, \mathrm{endowment}]$. The relationship between actual contribution y and desired contribution y^* is as follows:

For *opportunists* and *selfists*:

$$y = \begin{cases} 0 & \text{if } y^* \leq 0 \\ y^* & \text{if } 0 \leq y^* \leq \bar{y} \\ \bar{y} & \text{if } y^* \geq \bar{y} \end{cases} \tag{9a}$$

For free-riders:

$$y = 0 \tag{9b}$$

where $\bar{y}$ is 750 tokens for high-income individuals and 250 tokens for low-income individuals.

In order to incorporate the less rigid definition of a *free-rider*, a tremble parameter ω was introduced to account for possible loss of concentration. On any round, there is a probability ω that the individual will lose concentration and choose his/her contribution randomly. The tremble parameter has been previously used in the literature (Bardsley and Moffatt 2007, Loomes et al. 2002) and is specified similarly here, where it is allowed to decay throughout the experiment as follows:

$$\omega = \omega_0 * \exp\left[\omega_1 * (\text{period} - 1)\right] \tag{10}$$

With this specification, ω_0 represents the tremble at the beginning of the experiment, before any experience was accumulated, while ω_1 represents the rate of decay in the tremble parameter as experience accumulates throughout the experiment. Hence, we expect ω_0 to be positive and ω_1 to be negative.

Given the above assumptions, we can write the conditional probabilities of y on each behavioral category as follows:

Low-income individuals

For $y = 250$*:*

$$P(y = 250|op) = (1 - \omega) * \left[1 - \Phi\left(\frac{250 - \beta_0 - \beta_1 * RWB - \beta_2 * period - \beta_3 * male - \beta_4 * schoolyr}{\sigma}\right)\right] + \frac{\omega}{251}\ ] \quad (11)$$

$$P(y = 250|fr) = \frac{\omega}{251} \quad (12)$$

For $0 < y < 250$*:*

$$f(y|op) = (1 - \omega) * \frac{1}{\sigma} * \Phi\left(\frac{y - \beta_0 - \beta_1 * RWB - \beta_2 * period - \beta_3 * male - \beta_4 * schoolyr}{\sigma}\right) + \frac{\omega}{251} \quad (13)$$

$$f(y|fr) = \frac{w}{251} \quad (14)$$

For $y = 0$*:*

$$P(y = 0|op) = (1 - \omega) * \Phi\left(\frac{\beta_0 + \beta_1 * RWB + \beta_2 * period + \beta_3 * male + \beta_4 * schoolyr}{\sigma}\right) + \frac{\omega}{251} \quad (15)$$

$$P(y = 0|fr) = 1 - \frac{250\omega}{251} \quad (16)$$

High-income individuals

For $y = 750$*:*

$$P(y = 750|slf) = (1 - \omega) * \left[1 - \Phi\left(\frac{750 - \beta_0 - \beta_1 * PWD - \beta_2 * period - \beta_3 * male - \beta_4 * schoolyr}{\sigma}\right)\right] + \frac{\omega}{751} \quad (17)$$

$$P(y = 750|fr) = \frac{\omega}{751} \quad (18)$$

For $0 < \mathrm{y} < 750$*:*

$$\mathrm{f(y|slf)} = (1-\omega) * \frac{1}{\sigma} * \Phi\left(\frac{y-\beta_0-\beta_1*PWD-\beta_2*period-\beta_3*male-\beta_4*schoolyr}{\sigma}\right) + \frac{\omega}{751} \tag{19}$$

$$\mathrm{f(y|fr)} = \frac{\mathrm{w}}{751} \tag{20}$$

For $\mathrm{y} = 0$*:*

$$\mathrm{P(y=0|slf)} = (1-\omega) * \Phi\left(\frac{\beta_0+\beta_1*PWD+\beta_2*period+\beta_3*male+\beta_4*schoolyr}{\sigma}\right) + \frac{\omega}{251} \tag{21}$$

$$\mathrm{P(y=0|fr)} = 1 - \frac{750\omega}{751} \tag{22}$$

Using this model allows not only the estimation of the parameters in the above equations, but also the estimation of the fraction of *opportunists* among low-income individuals and the fraction of *selfists* among high-income individuals.

The estimated parameters for low- and high-income individuals are presented in Table 5. As expected, the coefficient on RWB was positive for *opportunists* and the coefficient on PWD was negative for *selfists*. This proves the dominance of the hypothesized motivations on the behavior of high- and low-income individuals. Based on these results, we are more confident about the conclusion that a substantial proportion of low-income individuals are behaving opportunistically by trying to entice the high-income type to submit generous contributions to the public good. Also, it is clear that the overruling majority of high-income individuals behave in a self-centered manner by keeping the bulk of their endowment rather than sharing it with the low-income type. It is worth noting that this result implies that low-income individuals were optimistic about the potential returns from increased contributions (they placed higher values on δ and γ), while high-income individuals were pessimistic about those prospects (they placed lower values on δ and γ). Moreover, it seems there are far more *free-riders* among low-income compared to high-income individuals. Whereas about a third of low-income individuals were estimated as *free-riders*, only 3% of high-income individuals were classified into this category. This implies that the self-interest exhibited by high-income individuals in the MHR and MDR might be justified by the significant free-riding tendencies of the low-income type.

The two tremble parameters were significant for both income types and carried the expected signs. While there is a significant probability that individuals will lose focus at the beginning of the experiment and contribute randomly, this probability consistently declines over the course of the experiment as subjects gain experience with the task. Also, it seems that low-income individuals are not only more prone to losing focus at the start of the experiment, they also acquire experience slower than high-income individuals. It is highly probable that this difference is due to the task being somewhat more complicated for the low-income type. This is illustrated by considering that the dominant motivation of high-income individuals pushes them towards the Nash equilibrium of acting in a more self-interested way and contributing less, while the dominant motivation of low-income individuals pushes them away from the Nash equilibrium by acting opportunistically and contributing more to the public good. Thus, it is reasonable to think that a low-income individual might have a higher tendency to contribute randomly; perhaps in the spirit of exploration.

Table 5. Finite Mixture, Two-Limit Tobit Model with Tremble

	High-Income Individuals		Low-Income Individuals	
Variable	Parameter	Std. Error	Parameter	Std. Error
Constant	56.60	(38.96)	405.63	(50.79)
RWB/PWD	136.53	(35.11)	-233.58	(39.78)
Period	-7.94	(3.89)	-16.73	(3.73)
Male	116.37	(26.26)	63.90	(33.64)
School Year	43.54	(12.78)	12.54	(11.20)
Sigma	84.61	(13.24)	299.15	(17.95)
w0	0.62	(0.04)	0.19	(0.11)
w1	-0.03	(0.01)	-0.37	(0.19)
P_opp/P_slf	0.65	(0.03)	0.97	(0.04)
Observations	840		840	
Log Likelihood	-3774.4507		-4684.7204	

The coefficient on the variable period conforms to the universal finding that contributions decay across rounds. Although small, this coefficient was negative and significant for both income types, which suggests a consistent decline in contributions as individuals gain more experience with the task during the experiment. As for the coefficients on the demographic variables male and school year, they conform to the previous estimates in that they are positive and significant for both income types. Again, this suggests that there is a higher tendency to contribute for males than females and for upper- than lower-school year students.

2.6 Conclusion

Voluntary contributions mechanisms (VCMs) present a convenient and potentially efficient provision method for public goods. The vast evidence of sizeable contributions under those mechanisms has directed interest towards determining the underlying motivations for this behavior. This paper investigates the interplay between income and relative marginal *per capita* return (MPCR) and their role in determining contribution levels in public goods settings.

A control and three treatments were constructed, where high- and low-income individuals were allowed to play separately and in mixed groups with homogenous and heterogeneous MPCRs. Subjects completed 12 rounds of a public goods game, consisting of 2 practice and 10 real rounds, and were paid using a randomized lottery incentive design in order to encourage more concentration in each round.

On average, low-income subjects displayed more cooperative behavior in the presence of the high-income type, but only in situations where this presence carried potential advantages to them. On the other hand, high-income subjects displayed more self-centered behavior in the presence of the low-income type when this presence carried potential disadvantages to them. Moreover, there was evidence of free-riding behavior among both income types, which stimulated the structural modeling of different behavioral categories within each income type and the estimation of the main characteristics of those categories.

The overall behavior of low-income individuals can be well explained by the presence of *free-riders*, who in most cases contribute very small amounts to the public good, and *opportunists*, who strategically try to attract and benefit from higher contributions by the high-income type. As for high-income individuals, their behavior was explained by the presence of *free-riders* and *selfists*, who deliberately try to segregate from the low-income type mainly due to a self-centered interest coupled with a sense of caution. However, it seems that the low-income type has a substantially higher propensity to free-ride than the high-income type, which might justify the inclination towards self-interest exhibited by high-income individuals.

In conclusion, this paper provides insights on the motivations driving the behavior of high- and low-income individuals in VCMs. The value of this paper derives from its relevance in real-world applications and its usefulness in informing policy-makers about potential interactions between large and small producers in voluntary generic advertisement programs. Understanding the dynamic relationship between income and relative returns and how they affect behavior in public goods settings can help us devise more efficient programs that enable higher voluntary contributions to public goods, hence relieving the conflict over mandatory generic advertising programs. While more work might be necessary to provide a better understanding of the forces that govern behavior in situations with heterogeneous income levels and relative returns, this article serves as a first step in uncovering important ways of targeting the critical elements that can help enhance efficiency of VCMs.

CHAPTER III

SOCIAL NORMS: FIRST IMPULSE OR LAST RESORT?

3.1 Introduction

It is well established that individual behavior in dictator games violates the predictions of economic theory. The bulk of the literature on this topic has shown that dictators are inclined to share around 30% of their endowment instead of adopting the payoff-maximizing strategy of keeping the entire amount. For instance, Engel (2011) conducted a meta-analysis where he plotted the distribution of average percent giving over 616 treatments from 129 studies and showed that it peaks around 28.4%.

Driven by these consistent deviations from Nash equilibrium, a long line of research has emerged with the purpose to investigate the main motivations behind this seemingly selfless willingness to give. The early models explained giving in dictator games using "other regarding preference", under which individuals are assumed to not only care about their own wellbeing, but also about the welfare of others. Under this paradigm, giving in dictator games is linked to either altruism, egocentrism, inequality aversion, or the Rawlsian maximin motive, which is a general tendency to help the least well-off (Fehr and Schmidt, 1999; Andreoni and Miller, 2002; Engelmann and Strobel, 2004; Fehr et al., 2006). However, these models fail to explain the anomalies of numerous experimental manipulations and findings reported in the literature (Dana et al., 2006; Broberg et al., 2007; Koch and Normann, 2008; Cappelen et al., 2013). As noted by Andreoni and Bernheim (2009) for instance, social preferences alone cannot account for the full extent of behavioral changes to treatments in dictator games, and if imposed to explain the distribution of dictator giving, would invoke strange assumptions about the utility function and/or distribution of individual preferences.

The major limitation of the philanthropic models is their inability to rationalize why variations in seemingly irrelevant parameters result in significant changes in behavior (Krupka and Weber, 2013). In fact, these models have been challenged with this very issue by several researchers who have introduced trivial changes in the context of the dictator game and obtained surprisingly different outcomes. For instance, Bolton et al. (1998) reported that restricting the dictator's action space has a weakly significant positive impact on the amount given. Moreover, Bardsley et al. (2005) and List (2007) have shown that individuals are significantly more prone to give zero when their action set includes the option of taking money away from the receiver.

If individuals were solely motivated by altruism, fairness, and inequality aversion, then simply allowing them to take money from the receiver, or restricting their action space to integer values, should not significantly affect the amount of money they decide to give. This is because the philanthropic person depicted by these models must make the transfer decision independent of the type of action space available. For example, if this person genuinely wanted to give a specific amount of money out of a desire to be fair or kind, then he should readily give the same amount regardless of whether or not an additional option of taking money away is presented.

A recent model that circumvents this issue, and that has become widely accepted among economists, argues that giving in dictator games originates from an urge to comply with social norms (Hoffman et al., 1996; Bolton et al., 1998; Fehr and Fischbacher, 2004; Krupka and Weber, 2013). The social norms model states that individuals give a positive amount in the dictator game because they feel a *social obligation* not to commit to the most selfish act of giving nothing, even if it was the payoff-maximizing strategy. To the extent that individuals abide by the prevailing social norms, these seemingly negligible changes in the experimental design could potentially lead to significant changes in behavior if they alter the underlying social structure of the setting. As

List (2007) argues, after introducing the "taking money" option, giving zero is no longer the most selfish act. This is especially the case in his symmetric treatment, where the dictator had the option of giving or taking up to $5 from the receiver. In this case, there is no social stigma associated with giving zero since it is now perceived as the neutral course of action.

There is ample evidence in the literature that supports the social norms interpretation of behavior in dictator games and similar interactive settings. The model accommodates a wide spectrum of behavioral responses to treatments including reductions in giving when the endowment is earned rather than simply granted (Cherry et al., 2002; Oxoby and Spraggon, 2008; List and Cherry, 2008) and when the receiver is also given an endowment (Eckel et al., 2005). In both cases, the social obligation of giving a significant positive amount is dissipated as the dictator's right to keep his endowment becomes more pronounced.

Following the logic behind the social norms model, the presence – or lack thereof – of well perceived norms along with a socially evaluative setting acts as the main underlying motive that shapes the decisions of individuals in dictator games. This point is clearly illustrated through the work of Frey and Bohnet (1995), who showed that giving significantly increased in one variant of the dictator game where dictators stood up in order to be seen by everyone in the room prior to making their decisions. Eichenberger and Oberholzer-Gee (1998) have also established this point by showing that dictators give more when the task is framed so that receivers are given the endowment and dictators are asked to decide how much to take away for themselves. Finally, Rigdon et al. (2009) demonstrated the role of social cues on dictator giving by presenting dictators with three dots in the shape of a watching eye. The authors report that the introduction of this form of minimal social cues led to a significant increase in dictator giving.

While the increased salience of social norms drives more giving in dictator games, the absence of such norms, as shown by Bardsley et al. (2005) and List (2007), carries the opposite effect. A particularly relevant study is Hoffman et al. (1994), who asserted that self-entitlement offers justifiable means for dictators to behave selfishly. The authors found that giving was substantially lower when subjects earned the right to become the dictator based on their scores in a general knowledge quiz. It seems that establishing property rights weakens the social norms associated with sharing half the endowment or offers flexibility of interpretation to disregard any norm advocating for equal split. After all, it is not socially inappropriate to give a smaller share of the endowment to the counterpart when possessing a rightful claim to that endowment.

The important role played by social norms in determining behavior in dictator games, and reasonably other interactive settings, warrants a closer consideration of the nature with which this social convention operates and shapes our decisions. A question that poses itself in this regard is whether individuals feel a *desire* or an *obligation* to comply with social norms. When confronted with a certain social setting, is looking for what is socially appropriate regarded as the primal instinct, or is it something which individuals consider only after they run out of excuses to justify selfish, payoff-maximizing behavior? That is, are social norms considered a first impulse or a last resort?

To address this question, we conducted a laboratory experiment where subjects were randomly assigned to one of three variants of the dictator game (control and two treatments). Receivers in all treatments were required to state their expectations regarding how much the dictators will transfer to them. However, the three versions differed in the way the dictator roles were assigned. Dictators were assigned randomly in the control group, while in treatment 1, hereafter "*real entitlement*", they were assigned based on merit, following Hoffman et al. (1994).

Subjects in treatment 2, hereafter "*fake entitlement*", were assigned in a way that was open for interpretation by the dictator. Although it was purely random, it was designed to give subjects some leeway to either treat it as such or claim it to be due to a personal skill. By comparing the behavior of dictators in the *fake entitlement* treatment to those in the control and *real entitlement* treatment, we can determine the way with which subjects regard social norms. Specifically, giving in the *fake entitlement* treatment should not be statistically different from the control if social norms are considered a first impulse, but should more closely resemble giving in the *real entitlement* treatment if they are considered a last resort.

Our results conform with previous findings concerning the level of giving in the standard version of the dictator game. Moreover, as with Hoffman et al. (1994), we report a substantial decrease in giving when role assignment was done based on performance in a general knowledge quiz. The behavior of dictators in the *fake entitlement* treatment, where role assignment was random but masqueraded in a way that was open for interpretation, more closely resembled behavior in the merit-based assignment than the control. This indicates that subjects were keen on utilizing a self-serving bias to legitimize their claim to the endowment. Based on these results, compliance with social norms, at least as far as the behavior of dictators is concerned, seems like a burden that is imposed on those who cannot justify self-centered behavior. Interestingly, while dictators took advantage of the nature of role assignment in the *fake entitlement* treatment to escape the social obligation of making sizable positive transfers, receivers were more inclined to call upon those social norms when asked to state their beliefs regarding how much they will be receiving. In fact, receiver expectations of dictator giving in the *fake entitlement* treatment were very similar to the control and significantly higher than the *real entitlement* treatment. We conclude that the perception of social norms as a first impulse or last resort is formed in a way that serves the individual's self-interest given his current circumstances.

This chapter extends the theoretical framework presented by Krupka and Weber (2013) to paint a more complete picture of the way individuals interact with social norms when deciding how much to give in dictator games and similar social settings. Our extended model can help explain the underlying effect of social framing on dictator giving, thus addressing the conflicting hypotheses that attribute social framing effects to a change in individuals' preferences versus a change in their beliefs (Ellingsen et al., 2012; Dreber et al., 2013). As discussed later, we argue that it is through their role in the individual's utility function that social norms, and social frames, affect dictator giving. Our notion is that individuals would mainly adopt a self-centered approach to a social setting so long that they can justify it (i.e., provided that they can behave this way without hurting their social image), but would succumb to social norms when the setting does not allow for an interpretation that can be used to maximize payoffs. The usefulness of this study lies in its ability to better explain the discrepancies between theory and laboratory behavior. Using our notion, a thorough assessment of the social structure of a particular setting can help us anticipate whether or not we will observe significant deviations from Nash equilibrium in that environment. Moreover, our results can prove useful as a basis from which valuable recommendations can be provided for charities and other fund-raising agencies on ways they can maximize the quantity and value of donations.

The rest of the chapter is organized as follows: section 2 presents the method used to elicit social norms across our three treatments. Section 3 includes a simple theoretical framework that explains the potential relationship between social norms and giving in dictator games. Section 4 describes the experimental design and data, while section 5 presents the main results along with robustness checks and a structural estimation of the parameters in the theoretical model. Section 6 includes a discussion of the implications of the notion advanced in the study, while section 7 summarizes the main findings and concludes.

3.2 Experimental Design

A total of 182 subjects (90 males and 92 females) were recruited to participate in the experiment in exchange for a $5 show-up fee. Participants were also informed that they might receive additional earnings depending on the outcome of the experiment. The subjects were undergraduate students at Texas A&M university with a mean age of 21 years.[5] The study was approved by the Institutional Review Board and the data was collected during the Summer 2016 and Fall 2016 semesters.

Upon arrival to their session, subjects were randomly assigned to one of two identical rooms (A and B), with equal number of participants in each room. Subjects were first given a consent form, which they had to read and sign, after which they were given thorough written instructions on the experimental procedure and the dictator game. The participants were instructed to remain quiet during the entire session and to raise their hand if they had any questions or needed any assistance with the protocol. The experimenters were available to answer any questions privately.

Each subject in room A was randomly paired with a subject from room B, where one of them played as the dictator and the other as the receiver. Dictators were given a $10 endowment and were asked to decide how much of that endowment they would like to transfer to the receiver in their pair (located in the opposite room). They were free to choose any amount between $0 and

[5] The average age was somewhat high due to the presence of a few subjects aged 30 and above.

$10 in $0.5 increments. As for receivers, they were asked to state their beliefs by guessing how much the dictator would transfer to them out of his $10 endowment. They were also free to choose any amount between $0 and $10 in $0.5 increments. The instructions made it clear that the subjects in each pair were in different rooms and will remain anonymous to one another. Moreover, the dictators were assured that their decisions will remain confidential and will not be linked to them in any way.

As mentioned before, participants were randomly assigned to the control and two treatments where the manner in which the dictator role was assigned differed across treatment. Dictator role assignment was made explicitly randomly in the control group, where participants were told that there were 50/50 odds that either subject in the pair will be selected as the dictator. In the *real entitlement* treatment, subjects were first asked to complete a general knowledge quiz, which consisted of 10 multiple choice questions. The questions spanned several topics including sports, science, history, geography, and political science. After completing the quiz, subjects were given their grade and the grade of the other member in their pair. It was explicitly stated that role assignment was based on performance in the quiz, where the subject with the higher grade would be chosen as the dictator. In this sense, the *real entitlement* treatment is designed to provide dictators with a rightful claim to the endowment, considering that they earned it through their performance in the general knowledge quiz. Similar to Hoffman et al. (1994), we expect the average amount given in this treatment to be significantly lower than the control.

The *fake entitlement* treatment was designed in a way that, depending on the subjects' interpretation, could be used to either mimic the control or the *real entitlement* treatment. Role assignment here was based on a die roll task. Each subject in the pair was asked to choose one of four different sizes of dice to play with (extra small, small, medium, and large). Moreover, they were given the choice between throwing their die in an open or closed space. Participants who chose the open space rolled their dice on the large table in front of them, while those who chose the closed space were given a box to roll their dice in.[6] The experimenters privately recorded the die roll for each participant in order to select the dictators. Participants were then given the results of their own die roll and the die roll of the other person in their pair. Again, it was explicitly stated that role assignment was based on the results from the die roll task, where the subject who rolled a higher number was chosen as the dictator. It is worth noting that Schurter and Wilson (2009) have also used a die roll to assign dictators and receivers. However, in their experiment, the way they used the die roll was equivalent to a coin flip, where one subject would be selected as the dictator if the die lands on an even number and vice versa. Moreover, they explicitly stated to the subjects that each had an equal chance of being selected as the dictator.

Although assignment is clearly random in the *fake entitlement* treatment, the choice of die size and rolling space was included to disguise this fact and open it to interpretation. Moreover, when given the results from the die roll task, subjects were explained that their counterparts have also made their choice of die size and rolling space. Dictators can then choose to either overlook the randomness in the role assignment and attribute it to their skill in picking the size and space with the best odds or acknowledge the task to be completely random and treat it as such. Which way they go will of course be determined through comparing the behavior in this treatment with the behavior in the control and the *real entitlement* treatment, which in turn will help us gauge the general willingness to take advantage of this situation to escape from the social norm and justify a self-serving bias for payoff-maximizing behavior. Participants in the control group were kept for

[6] Subjects were aware of the nature of the environment associated with the open and closed space options before making their decision between them.

a few minutes prior to playing the dictator game. This was done in order to balance the participation duration for subjects across all treatments. On average, the amount of time taken to complete the general knowledge quiz was 10 minutes, which was similar to the time it took to conduct the die roll task. Following the dictator game, subjects filled out a short demographics survey, after which they privately received their payments in a sealed envelope and were escorted out of the session.

In order to elicit the social norms associated with the three treatments in this study, an incentivized survey was conducted on a different sample of subjects within the same population. A total of 908 subjects completed the survey, where each was randomly presented with one of the three scenarios pertaining to the three treatments. The survey then asked the subject to rate the social appropriateness of each action available to the dictator in the experiment. Since dictators were allowed to give any amount between \$0 and \$10 in \$0.5 increments, there are a total of 21 possible actions. Participants provided their ratings on a four-point scale, following Krupka and Weber (2013). Specifically, the options were "very socially inappropriate", "somewhat socially inappropriate", "somewhat social appropriate", and "very socially appropriate". Similar to Krupka and Weber (2013), a value of -1, $-1/3$, $1/3$, and 1 respectively was assigned to each classification. Hence, the social appropriateness of an action is bounded between -1 for the most socially inappropriate act and 1 for the most socially appropriate act.

3.3 Theoretical Framework

This section includes a description of the main hypotheses regarding compliance with social norms. The theoretical model entails a decision maker choosing one action a_k from a finite set of possible actions $A = \{a_1, \dots, a_K\}$. We adopt the framework used by Krupka and Weber (2013) to define the decision maker's utility function over a certain action as:

$$u(a_k) = v\big(\pi(a_k)\big) + \gamma N(a_k) \tag{23}$$

where the first term on the right-hand side represents the utility derived from the payoff associated with the action and the second term stands for the utility (disutility) resulting from choosing a socially appropriate (inappropriate) action. Specifically, the function $N(a_k)$ is directly proportional to the social appropriateness of action a_k and can take any value in the interval $[-1, 1]$. The sign of $N(a_k)$ indicates the general appropriateness or inappropriateness of the action, where $N(a_k) > 0$ if a_k represents socially prescribed behavior and $N(a_k) < 0$ if a_k represents socially proscribed behavior. Moreover, the degree of appropriateness (inappropriateness) of the action is reflected in the magnitude of $N(a_k)$, such that $N(a_k)$ becomes more positive (negative) the more appropriate (inappropriate) the action is perceived.

In the basic model of Krupka and Weber (2013), the parameter γ represents the degree to which decision makers care about complying with social norms. While this model does a great job in explaining the subject-specific portion of social norm compliance, it does not account for the situation-specific part. That is, it does not tell us how the value placed on social norm compliance changes under different situations (i.e., treatments). Hence, we extend the original model of Krupka and Weber (2013) in order to incorporate the perception of social norm compliance as either a first impulse or last resort. This is done using the additional assumption that the parameter γ might depend on the decision maker's ability to justify deviations from the social norm. Intuitively, it is reasonable to think that the importance people place on compliance with a certain social norm will likely depend on how well they can justify nonadherence to it. In other words, individuals might not care as much about adhering to a specific social norm if they think they have a valid excuse for deviating from it. Let ρ be an indicator variable of whether the context allows for an interpretation that the decision maker can use to break the social norm (i.e., $\rho = 1$ if an alternative interpretation exists and $\rho = 0$ otherwise), then our additional assumption can be written as $\gamma = \gamma(\rho)$ and the model becomes:

$$u(a_k) = v\big(\pi(a_k)\big) + \gamma(\rho)N(a_k). \tag{24}$$

In the conventional dictator game (control treatment), where role assignment is explicitly random, there are clear social norms against giving zero and towards giving half the endowment as shown by Krupka and Weber (2013). Moreover, this setting does not allow the individual to form an interpretation to escape these norms (i.e., $\rho = 0$). In this case, the decision maker's utility function takes the form:

$$u(a_k) = v\big(\pi(a_k)\big) + \gamma(0)N(a_k). \tag{25}$$

Conversely, in the *fake entitlement* treatment, where role assignment is implicitly random but open for interpretation, the utility function takes the form:

$$u(a_k) = v\big(\pi(a_k)\big) + \gamma(1)N(a_k). \tag{26}$$

The utility function in the *real entitlement* treatment takes the same form as the *fake entitlement* treatment since even if social norms existed for an equal split, the setting obviously justifies selfish behavior.

Given this framework, the hypotheses regarding the perception of social norm compliance as a first impulse or last resort can be stated in terms of the relationship between $\gamma(0)$ and $\gamma(1)$.

Hypothesis 1 (Social Norms as a First Impulse)

Giving rates in the fake entitlement treatment will be similar to the conventional dictator game (control treatment) and significantly higher than the real entitlement treatment $(i.e., \gamma(0) = \gamma(1) > 0)$.

The first hypothesis supports the perception of social norms as a first impulse. This means that the individuals' primary inclination is to determine the socially appropriate course of action regardless of whether or not they see an opportunity to justify self-centered behavior. Hence, they will overlook the possibility of favorable interpretation in the *fake entitlement* treatment and treat role assignment as completely random.

Hypothesis 2 (Social Norms as a Last Resort)

Giving rates in the fake entitlement treatment will be significantly lower than the conventional dictator game (control treatment) and similar to the real entitlement treatment $\left(i.e., \gamma(0) > 0 \geq \gamma(1)\right)$.

This hypothesis is more in line with the argument that compliance with social norms is considered a last resort. That is, individuals will behave in accordance with social norms only in the absence of a self-serving bias that can maximize their payoffs. Hence, subjects will take advantage of the situation in the *fake entitlement* treatment to vindicate their low giving rates.

Hypothesis 3 (Social Norms as a Dual Perception)

Giving rates in the fake entitlement treatment will be significantly lower than the conventional dictator game (control treatment) and significantly higher than the real entitlement treatment $(i.e., \gamma(0) > \gamma(1) > 0)$.

The third hypothesis accommodates a dual perception of social norm compliance in the society as both a first impulse and a last resort. In this case, there would be a significant proportion of the population on either side of the spectrum. Some will recognize the randomness and give high amounts in the *fake entitlement* treatment, while others will hide behind the interpretability of the environment and give low amounts.

3.4 Results

3.4.1 Analyzing Giving Behavior

3.4.1.1 Descriptive Statistics

Table 6 provides summary statistics of dictator giving for each treatment. A bar graph displaying the average level of giving by treatment is also presented in Figure 3.

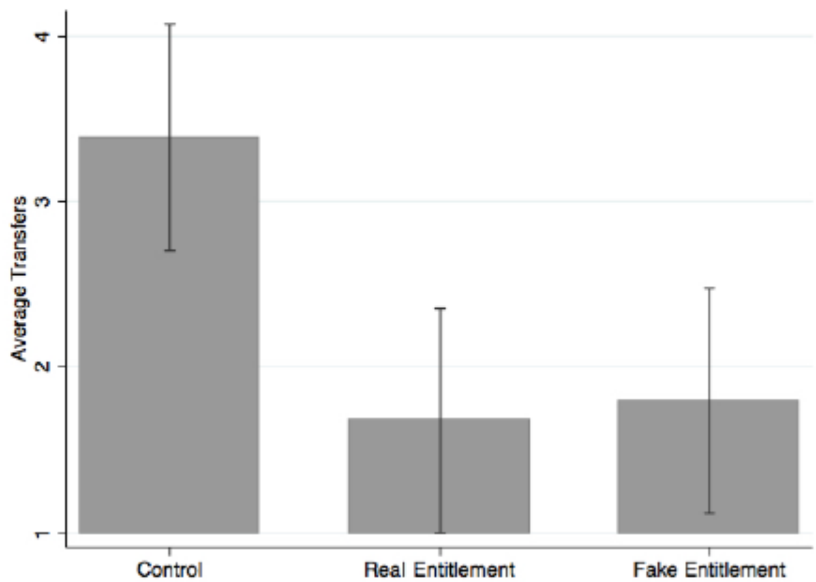

Figure 3. Average Dictator Giving by Treatment

Table 6. Summary Statistics of Dictator Giving by Treatment

Variable	Min	Max	Median	Mean	Std. Dev.
Control	0	5	4	3.39	1.87
Real Entitlement	0	5	1	1.68	1.84
Fake Entitlement	0	5	1.5	1.79	1.79

Result 1. *Giving in the conventional dictator game (control treatment) conforms with the general finding in the literature.*

As seen in Table 6 and Figure 3, individual giving levels in the control group ranged from \$0 to \$5, with a median of \$4. More importantly, average giving in the control was around \$3.4. This result is in line with the literature, where average giving rates constitute around 30% in the standard version of the dictator game. In fact, a t-test shows that average giving in our control group was not statistically different from \$3 ($P = 0.258$).

Result 2. *Consistent with Hoffman et al. (1994), giving rates decrease substantially when dictator roles are earned by merit.*

There was a significant reduction in average giving between the control group and *real entitlement* treatment (Mann-Whitney test, $P = 0.002$), where average giving in the latter dropped to \$1.68. In order to confirm the significance of this result, we apply the multiple hypothesis testing algorithm proposed in theorem 3.1 of List et al. (2016). Adapted to this study, the procedure by List et al. (2016) ensures a minimal chance of false positives when testing multiple treatment effects (in this case the *real* and *fake entitlement* treatments). The result is robust to this procedure, where average giving in the *real entitlement* treatment is still significantly lower than the control (multiplicity adjusted test by List, $P = 0.001$). As expected, it seems that earning the right to become the dictator, by outperforming the counterpart in the general knowledge quiz, instills a sense of ownership over the endowment which dilutes the social stigma associated with unwillingness to share and removes the social norm towards giving generous amounts.

Interestingly, average giving in the *fake entitlement* treatment was substantially lower than the control (Mann-Whitney test, $P = 0.003$; multiplicity adjusted test by List, $P = 0.005$). At a level of $\$1.79$, it more closely resembled behavior in the real entitlement treatment (Mann-Whitney test, $P = 0.704$; multiplicity adjusted test by List $P = 0.797$), which indicates that role assignment in the fake entitlement treatment was treated as if it was genuinely based on skill. This result provides evidence favoring the view of social norms as a last resort. It seems that the mere introduction of a more flexible interpretation of role assignment was enough to induce subjects to give less, as they would clearly do if their ownership of the endowment was truly deserved.

The same result is illustrated in Figure 4, which plots the histogram of giving by treatment. While there were a few instances where subjects kept the entire endowment in the control group, they only accounted for around 16% of the observations, with more than 40% giving the fair share of half their endowment. In fact, around 70% of subjects gave $3 or more in the control group. On the other hand, the histograms of the *real* and *fake entitlement* treatments are clearly shifted to the left compared to the control, where the frequency of $5 transfers decreases by half in both cases. The majority of subjects in the *real* and *fake entitlement* treatments gave an amount less than or equal to $2, with more than 30% giving zero in each treatment. Based on a K-S test, the distribution

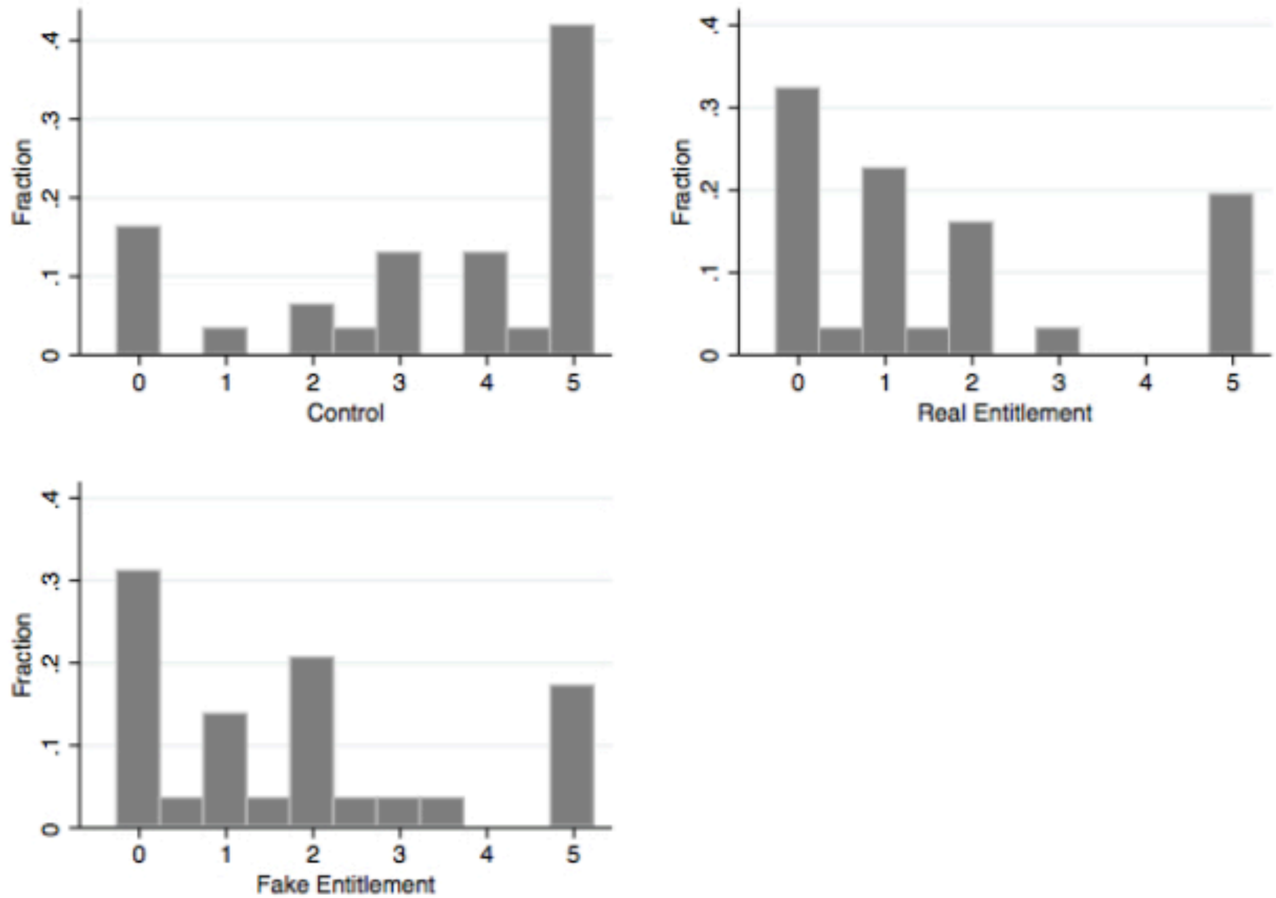

Figure 4. Histogram of Dictator Giving by Treatment

Table 7. Summary of the Social Norm Measures Across Treatments

	Control Group (C) Explicit Random Assignment (n = 306)					Real Entitlement (T1) Explicit Merit-Based Assignment (N = 308)					Fake Entitlement (T2) Implicit Random Assignment (n = 293)							
Action	**Mean**	**- -**	**-**	**+**	**+ +**	**Mean**	**- -**	**-**	**+**	**+ +**	**Mean**	**- -**	**-**	**+**	**+ +**	**C vs. T1**	**C vs. T2**	**T1 vs. T2**
Give $0	**-5.4**	55%	28%	10%	7%	**-0.54**	54%	28%	13%	5%	**-0.55**	57%	25%	12%	6%	0.907	0.924	0.833
Give $0.5	**-6.7**	64%	25%	7%	4%	**-0.68**	62%	30%	6%	2%	**-0.67**	64%	27%	6%	3%	0.786	0.931	0.856
Give $1	**-0.53**	48%	37%	11%	4%	**-0.47**	42%	38%	17%	3%	**-0.51**	46%	39%	11%	4%	0.119	0.569	0.332
Give $1.5	**-0.49**	45%	39%	12%	4%	**-0.42**	40%	38%	19%	3%	**-0.47**	41%	42%	14%	3%	0.129	0.577	0.333
Give $2	**-0.28**	27%	45%	22%	6%	**-0.19**	24%	39%	29%	8%	**-0.25**	27%	43%	21%	9%	0.050	0.476	0.235
Give $2.5	**-0.3**	25%	48%	23%	4%	**-0.21**	21%	46%	27%	6%	**-0.28**	23%	49%	24%	4%	0.035	0.611	0.111
Give $3	**-0.17**	19%	43%	31%	7%	**-0.01**	11%	41%	36%	12%	**-0.11**	14%	46%	33%	7%	0.001	0.183	0.031
Give $3.5	**-0.1**	13%	47%	31%	9%	**0.04**	8%	38%	45%	9%	**-0.1**	13%	45%	34%	8%	0.001	0.898	0.002
Give $4	**0.2**	5%	28%	49%	18%	**0.31**	3%	19%	56%	22%	**0.23**	4%	25%	53%	18%	0.005	0.408	0.046
Give $4.5	**0.26**	5%	22%	52%	21%	**0.37**	3%	16%	53%	28%	**0.27**	6%	23%	46%	25%	0.010	0.854	0.023
Give $5	**0.87**	1%	2%	12%	85%	**0.85**	0%	4%	14%	82%	**0.85**	2%	2%	13%	83%	0.606	0.614	0.981
Give $5.5	**0.62**	2%	8%	34%	56%	**0.46**	4%	15%	40%	41%	**0.54**	4%	11%	36%	49%	0.000	0.046	0.096
Give $6	**0.54**	3%	9%	40%	48%	**0.41**	4%	18%	40%	38%	**0.46**	5%	13%	40%	42%	0.002	0.047	0.288
Give $6.5	**0.42**	5%	16%	40%	39%	**0.24**	7%	29%	36%	28%	**0.33**	7%	21%	37%	35%	0.000	0.080	0.061
Give $7	**0.39**	6%	19%	34%	41%	**0.2**	8%	33%	30%	29%	**0.27**	10%	24%	31%	35%	0.000	0.019	0.183
Give $7.5	**0.3**	9%	23%	32%	36%	**0.08**	14%	36%	25%	25%	**0.19**	15%	25%	26%	34%	0.000	0.052	0.068
Give $8	**0.29**	12%	21%	30%	37%	**0.08**	17%	30%	26%	27%	**0.17**	18%	23%	25%	34%	0.000	0.047	0.111
Give $8.5	**0.21**	16%	23%	24%	37%	**-0.03**	25%	28%	23%	24%	**0.09**	24%	20%	25%	31%	0.000	0.063	0.051
Give $9	**0.18**	20%	18%	26%	36%	**-0.07**	31%	22%	23%	24%	**0.09**	27%	18%	21%	34%	0.000	0.145	0.015
Give $9.5	**0.12**	25%	16%	24%	35%	**-0.14**	37%	21%	19%	23%	**0.01**	31%	18%	19%	32%	0.000	0.091	0.022
Give 10	**0.25**	24%	11%	20%	45%	**-0.03**	36%	15%	18%	31%	**0.12**	31%	11%	16%	41%	0.000	0.057	0.029

of giving in the control group was significantly different from the one in the *fake entitlement* ($P = 0.007$) and *real entitlement* ($P = 0.000$) treatments. However, the same test failed to detect a significant difference between the distributions of the *fake* and *real entitlement* treatments ($P = 0.136$).

3.4.1.2 Theoretical Model Estimation

We now estimate the parameters $\gamma(0)$ and $\gamma(1)$ to provide a more rigorous test of the hypotheses concerning the perception of social norm compliance. Estimation of these parameters was done using the social norm measures obtained from the incentivized survey for each treatment. Table 7 summarizes those measures. As can be seen, giving half the endowment seems to be the most socially appropriate act in all treatments. Moreover, giving less than \$3 is viewed as socially inappropriate for all treatments, since $N(a_k)$ was negative for those amounts. While the norms in the control and *fake entitlement* were almost identical, the *real entitlement* differed in that social norms dropped drastically for amounts higher the \$5.

Table 8. Conditional Logit Estimates Model Across Treatments

	Control Group	Real Entitlement	Fake Entitlement
Variable	Coefficient (Std. Err.)	Coefficient (Std. Err.)	Coefficient (Std. Err.)
Payoff (β)	1.253 ***	2.174 ***	1.515 ***
	(0.242)	(0.390)	(0.296)
Social Appropriateness (γ)	5.103 ***	-1.015 ***	-2.712 ***
	(0.822)	(0.353)	(0.559)
Observations	651	651	609
Log Likelihood	-63.505	-57.154	-59.659

Result 3. *Individuals have a tendency for utilizing a self-serving bias that can help them escape unfavorable social norms, meaning that compliance with social norms, at least as far as the behavior of dictators is concerned, seems more like a last resort.*

Table 8 presents the parameter estimates across the three treatments using the social norms presented in table 7. A conditional logit model was estimated where the dependent variable is an indicator variable of whether the subject selected the action. As expected, the parameter on the payoff is positive and significant for all treatments, which reasonably implies that individuals derive a positive utility from higher monetary rewards. More importantly, while the coefficient estimate on the social norms variable was positive and significant for the control treatment, it was negative and significant for both the *real* and *fake entitlement* treatments. This means that individuals were placing a high importance on social norm compliance only in the control treatment, when there was no possible justification for breaking the norm. However, they do not seem to care about compliance when the justification becomes available. This illustrates the extension to the model presented by Krupka and Weber (2013), as it shows that the parameter γ is in fact situation-specific. The fact that social norm compliance was not important in the *real entitlement* treatment cannot be taken as evidence towards either view (first impulse or last resort), since it can be argued that the behavior in this treatment is driven by the perception that the endowment was fairly deserved. However, seeing that it is also not important in the *fake entitlement* treatment stands as clear evidence supporting the view of social norm compliance as a last resort.

3.4.1.3 Robustness Check

The robustness of our findings is demonstrated by estimating several Tobit regression specifications, which captured the effect of both treatments on average giving. As shown in Table 9, the specification in the first column investigated the relationship using indicator variables for the two treatments as the only explanatory variables, while the one in column 2 controlled for demographic and socioeconomic characteristics. Column 3 included the two treatment variables along with the variables labeled "die roll difference" and "quiz score difference", which, as the names imply, measure the difference in the die roll and quiz score between subject pairs in the *fake entitlement* and *real entitlement* treatments respectively. The idea behind those variables is to evaluate whether dictators have a tendency to adjust their decisions based on how much they have outperformed their counterparts in the role assignment task. For example, it is not unreasonable to expect that dictators might be inclined to give more when the receiver's performance is comparable to theirs as opposed to when it is far worse.[7] Finally, the specification in the fourth column combines all the variables in the first three regressions.

Results from Table 9 tell a very similar story to the one described based on the analysis presented so far. The coefficients on the two treatment variables were negative and significant across all specifications, implying that there was indeed a sizable decrease in giving in the fake entitlement and real entitlement treatments compared to the control. Similar to the previous analysis, we can also see that the coefficient on the *real entitlement* dummy was slightly more negative than the one associated with the *fake entitlement* dummy, although the difference was not statistically significant in any of the specifications. Interestingly, all the other coefficients were not

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[7] One can also argue for the opposite scenario, where the dictator might choose to give more when the performance differential is higher out of pity, for example.

statistically different from zero. This indicates that the average level of giving did not significantly differ across gender, school year, or income level. But more importantly, it also means that the level of giving was not really tied to the performance differential in the role assignment task. In other words, how well the receiver performed in comparison with the dictator was irrelevant to the latter when making his transfer decision. In some sense, this result is supportive of the idea that dictators were treating social norms as a last resort and were trying to find any means that can rationalize self-interested behavior. No matter how close their counterpart's performance was to theirs, the fact that they received a higher score on the test, or had a higher die roll, was enough to instill a sense of entitlement to the endowment, which they can use to justify their low giving rates.

Table 9. Tobit Regressions of the Effect of Real and Fake Entitlement on Dictator Giving

	[1]	[2]	[3]	[4]
Variable	Parameter (Std. Error)	Parameter (Std. Error)	Parameter (Std. Error)	Parameter (Std. Error)
Constant	3.216 ***	3.597 ***	3.216 ***	3.697 ***
	(0.424)	(1.213)	(0.423)	(1.238)
Fake Entitlement	-1.870 ***	-1.976 ***	-1.977 *	-2.133 **
	(0.618)	(0.641)	(1.018)	(1.042)
Real Entitlement	-2.016 ***	-2.107 ***	-2.456 **	-2.469 **
	(0.609)	(0.624)	(1.148)	(1.209)
Male	-	-0.139	-	-0.152
		(0.522)		(0.530)
Schoold Year	-	-0.148	-	-0.159
		(0.289)		(0.291)
Low Income	-	0.465	-	0.397
		(0.706)		(0.729)
Medium Income	-	-0.280	-	-0.339
		(0.850)		(0.863)
Die Roll Difference	-	-	0.045	0.066
			(0.342)	(0.345)
Quiz Score Difference	-	-	0.227	0.183
			(0.501)	(0.520)
Sigma	2.324 ***	2.301 ***	2.321 ***	2.299 ***
	(0.215)	(0.213)	(0.215)	(0.213)
Observations	91	91	91	91
Log Likelihood	-174.9021	-174.150	-174.791	-174.070

Notes: The data contained a total of 19 left-censored observations. No right-censoring was necessary since no one chose to transfer the maximum amount allowable. Hence, a left-censored Tobit is sufficient to account for censored observations. Considering the significance of sigma under all specifications, a Tobit regression generates significantly different estimates compared to an OLS regression. Significance levels: *:10% **:5% ***1%.

3.4.1.4 Double Hurdle Model

The analysis presented so far provides compelling evidence favoring the notion that social norms are not the first course of action sought by dictators. However, it might be argued that the treatment effects may be skewed due to the presence of "*non-givers*", who are individuals that transfer zero under all circumstances and not just as a result of the presented treatments. If a significant fraction of *non-givers* existed, the resulting treatment effects might be overestimated since a portion of the decrease in the average giving in the *real entitlement* and *fake entitlement* treatments could be attributed to their presence.

We address this issue by constructing a double hurdle model to obtain more conservative estimates of the treatment effects. The model enables us to isolate the effect of the two treatments from the effect of the presence of *non-givers*. Specifically, it assumes two different classifications of individuals: *givers* and *non-givers*.[8] *Givers* are individuals whose behavior is driven by the prevailing social norms, while *non-givers* are individuals who always transfer zero regardless of the circumstances they face. Considering the significant clustering at zero in all treatments, and the fact that *givers* might also elect to transfer zero in some cases, the double hurdle model was applied within the framework of Tobit regressions.[9] Let p represent the proportion of the population who are *givers*, so that the proportion of *non-givers* is $1 - p$. While the latter group is automatically assumed to give zero, the behavior of the former can be modeled using the following equation:

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[8] In a double hurdle model, positive transfers are made upon passing two separate hurdles. The _rst puts the subject in the category of givers as opposed to non-givers. Then, conditional on being of the giver type, he/she may still elect to transfer zero but can also transfer a positive amount.
[9] Only leftward censoring was applied since there were no observations at the upper limit of $10.

$$y_i^* = x_i'\beta + u_i \tag{27}$$

where y_i^* is the desired level of giving, x_i' is a vector of explanatory variables, and $u_i \sim N(0, \sigma^2)$ is the error term. While y_i^* can take any value on the real numbers line (an individual may desire to give any amount he wants), the actual amount that can be given, y_i, is restricted between \$0 and \$10 in the dictator game. Hence, the relationship between desired transfers and actual transfers is given by:

$$\mathrm{y_i} = \begin{cases} 0 & \text{if } \mathrm{y_i^*} \leq 0 \\ \mathrm{y_i^*} & \text{if } \mathrm{y_i^*} > 0 \end{cases} \tag{28}$$

Given the above framework, the log likelihood function can be represented as:

$$\log \mathrm{l} = \sum_{\mathrm{i}=1}^{\mathrm{n}} \left(\mathrm{I}_{\mathrm{y_i}=0} \ln \left[1 - \mathrm{p}\Phi\left(\frac{\mathrm{x_i'}\beta}{\sigma}\right) \right] + \mathrm{I}_{\mathrm{y_i}>0} \ln \left[\mathrm{p}\frac{1}{\sigma}\phi\left(\frac{\mathrm{y_i} - \mathrm{x_i'}\beta}{\sigma}\right) \right] \right) \tag{29}$$

Using this model will guarantee estimates that are not contaminated by the presence of *non-givers* and more accurately capture the true treatment effects. Moreover, it also allows estimation of the fraction of individuals belonging to each type.

Table 10 presents the results from the double hurdle model estimation. Around 20.5% of subjects fell in the category of *non-givers*, with the remaining 79.5% classified as *givers*. The average treatment effect estimates are negative and significant. They are also very similar in magnitude to the estimates presented in Table 9. This strengthens our conclusion that dictators in the *fake entitlement* treatment were taking advantage of the situation and behaving as if the results of the task were based on their own skill, implying that subjects would readily try to escape from the obligation of complying with social norms rather than impulsively seeking those norms as their first course of action.

Table 10. Structural Model to Separate the Treatment Effects from Pure Non-Giving Behavior

	Constant	Fake Entitlement	Real Entitlement	Sigma	P_Giver
Parameter	4.012 ***	-1.757 ***	-1.934 ***	1.663 ***	0.795 ***
Std. Error	(0.333)	(0.554)	(0.549)	(0.194)	(0.059)

Notes: The number of observations was 91 and the log likelihood ratio -172.470. Significance levels: *:10% **:5% ***1%.

3.4.2 Analyzing Receiver Expectations of Giving Behavior

3.4.2.1 Descriptive Statistics

As mentioned before, the receivers were required to state how much they expect the dictator will transfer to them. They were free to choose any value between $0 and $10 in $0.5 increments. Panel a of Figure 5 shows the average receiver expectation by treatment, while panel b plots the same bars alongside actual dictator giving from Figure 3. Summary statistics of receiver expectations by treatment are also given in Table 11.

Result 4. *Receivers invoked social norms when asked to state their beliefs regarding how much the dictators will transfer to them, indicating that the perception of social norms as a first impulse or last resort is made in the way that generates the more favorable outcome to the individual.*

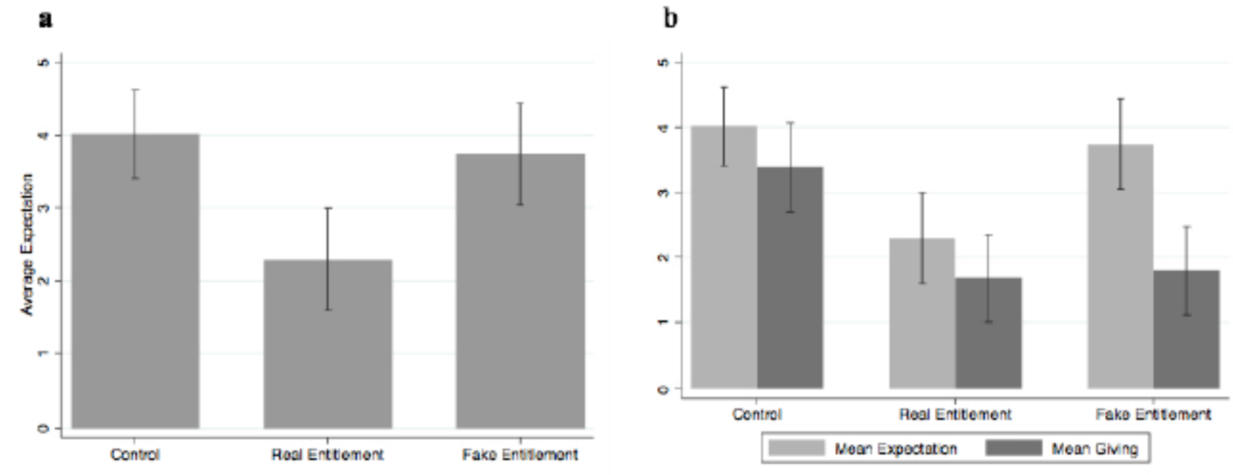

Figure 5. Average Dictator Giving and Receiver Expectation by Treatment

Table 11. Summary Statistics of Receiver Expectations by Treatment

Variable	Min	Max	Median	Mean	Std. Dev.
Control	0	7.5	5	4.02	1.65
Real Entitlement	0	6	2	2.29	1.92
Fake Entitlement	0	7	5	3.74	1.83

As we can see, receivers in the control group and the *real entitlement* treatment were relatively accurate regarding how much they expected to receive from the dictators. In fact, there was no statistically significant difference between average dictator giving and average receiver expectation in those two treatments (Mann-Whitney test, $P > 0.174$), although expectations slightly exceeded giving in both cases. Interestingly, receiver expectations in the *fake entitlement* treatment more closely resembled expectations in the control group, contrary to actual giving behavior in this treatment which was closer to behavior in the *real entitlement* treatment. A comparison of average expectations across treatments reveals that the difference between the control and *fake entitlement* treatment was statistically insignificant (Mann-Whitney test, $P = 0.560$; multiplicity adjusted test by List, $P = 0.545$), while average expectations in the real entitlement treatment were significantly lower than the control (Mann-Whitney test, $P = 0.001$; multiplicity adjusted test by List, $P = 0.000$) and the *fake entitlement* treatment (Mann-Whitney test, $P = 0.003$; multiplicity adjusted test by List, $P = 0.01$). Moreover, average expectations were significantly higher than average giving in the *fake entitlement* treatment (Mann-Whitney test, $P = 0.000$).

The same result can be seen from the histograms of average expectations of dictator giving by treatment, which are plotted in Figure 6. As shown in the figure, the distribution of average expectations was very similar in the control group and *fake entitlement* treatment, where the majority of subjects reported expectations of half the endowment and only around 10% expected to receive nothing in both cases. A K-S test failed to detect any significant differences between the control and *fake entitlement* treatment ($P = 0.893$). On the other hand, it is clear that the distribution of expectations was significantly shifted to the left in the *real entitlement* treatment, which was bimodal at \$0 and \$2 with only around 15% expecting to receive half the endowment. Based on a K-S test, this distribution was significantly different from the control group ($P = 0.004$) and the *fake entitlement* treatment ($P = 0.03$). The results above indicate that receivers advocated the perception of social norms as a first impulse when responding to how much they think the dictators would transfer. So, while winners in the die roll task behaved as if they were convinced of their superior performance, losers were able to see beyond the ambiguity of the task and correctly attributed the performance of both parties to luck. We conclude that individuals form their perception of social norm compliance based on a self-serving bias towards the more favorable outcome. That is, while dictators were prompted to interpret the results of the die roll task in a way that helps them escape the social obligation of making sizable positive transfers, receivers found themselves in a disadvantageous position under this interpretation and so were predisposed to call upon social norms when asked to guess how much they will be receiving.

3.4.2.2 Robustness Checks

Tobit regressions were estimated to further analyze the effect of the two treatments on average receiver expectations. The results are displayed in Table 12 using the same specifications as in Table 9. Consistent with the results in the previous subsection, the coefficient on the *fake entitlement* variable was not statistically significant, while the one associated with the *real entitlement* variable was negative and significant across all specifications. As noted earlier, this implies that average expectations were similar in the control and *fake entitlement* treatment and were significantly higher than average expectations in the *real entitlement* treatment. Again, none of the other coefficients were significant, which indicates that receiver expectations did not depend on gender, school year, income level, or performance differential in the role assignment tasks. The insignificance of the coefficients associated with the “die roll difference” and “quiz score difference” variables highlights an interesting point that is worth noting. It seems that no matter how much worse receivers did in the die roll task relative to the dictators, they still held the general view that dictators are expected to follow the social norm and make sizable positive transfers. On the other hand, when the task was unquestionably linked to merit, as is the case in the *real entitlement* treatment, the social stigma against giving nothing was diluted and receivers correctly expected that dictators will make very small transfers, if any, no matter how close their scores were on the general knowledge quiz.

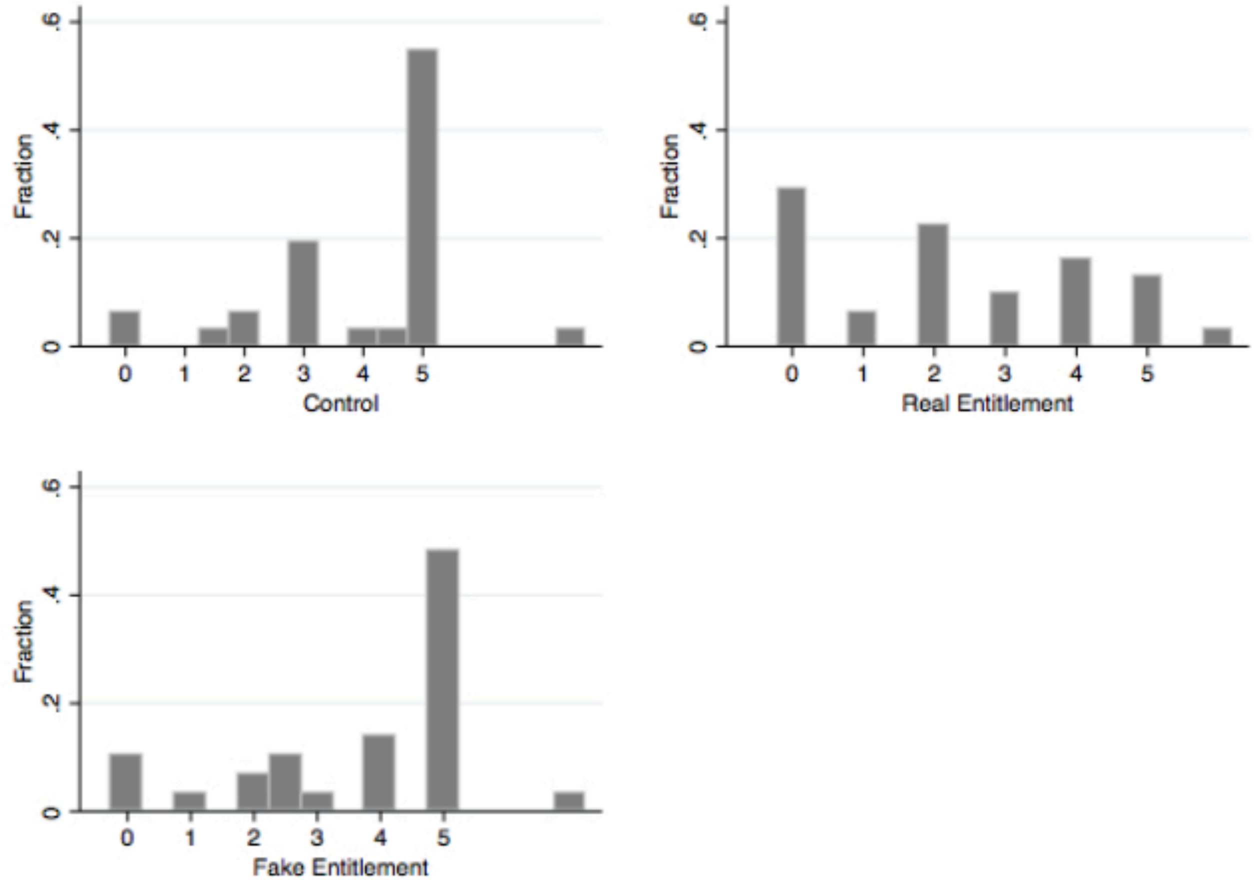

Figure 6. Histogram of Expectations of Dictator Giving by Treatment

Table 12. Tobit Regressions of the Effect of Real and Fake Entitlement on Receiver Expectation

Variable	[1] Parameter (Std. Error)		[2] Parameter (Std. Error)		[3] Parameter (Std. Error)		[4] Parameter (Std. Error)	
Constant	3.966	***	3.080	***	3.966	***	3.111	***
	(0.370)		(0.824)		(0.368)		(0.824)	
Fake Entitlement	-0.309		-0.247		0.281		0.108	
	(0.533)		(0.536)		(0.867)		(0.864)	
Real Entitlement	-1.993	***	-1.845	***	-2.157	**	-2.236	**
	(0.531)		(0.528)		(0.983)		(0.969)	
Male	-		0.721		-		0.710	
			(0.434)				(0.450)	
Schoold Year	-		0.155		-		0.152	
			(0.220)				(0.219)	
Low Income	-		0.014		-		-0.006	
			(0.526)				(0.526)	
Medium Income	-		-0.090		-		-0.121	
			(0.655)				(0.656)	
Die Roll Difference	-		-		0.252		0.151	
					(0.293)		(0.295)	
Quiz Score Difference	-		-		-0.086		-0.202	
					(0.429)		(0.430)	
Sigma	2.051	***	2.009	***	2.041	***	2.002	***
	(0.173)		(0.170)		(0.172)		0.169	
Observations	91		91		91		91	
Log Likelihood	-180.9641		-179.3672		-180.577		-179.117	

Notes: The data contained a total of 14 left-censored observations. No right censoring was necessary since no one expected to receive the maximum amount allowable. Hence, a left-censored Tobit is sufficient to account for censored observations. Considering the significance of sigma under all specifications, a Tobit regression generates significantly different estimates compared to an OLS regressions. Significance levels: *:10% **:5% ***1%.

3.5 Discussion

While the model presented by Krupka and Weber (2013) was very useful in explaining various results from previous investigations with dictator games, our extended model takes us one step further to painting a complete picture that can fully explain how individuals interact with, and are influenced by, social norms. In light of the evidence that γ is dependent on ρ, the parameter $\gamma(\rho)$ in our model can be interpreted as how likely individuals believe they can not comply with social norms without hurting their social image. In this regard, our simple extension will strengthen the model of Krupka and Weber (2013) as it can be used to rationalize responses to treatments that were not accounted for in the original model.

It can be argued that most of the treatment manipulations that were previously done in dictator games have either changed the structure of social norms (the $N(a_k)$ variable) or the weight individuals place on compliance with those norms (the $\gamma(\rho)$ parameter). We will discuss a few examples in this section starting with the double-blind treatment introduced by Hoffman et al. (1994), where the actions of the dictator are concealed from other participants as well as the experimenters. As shown by the authors, giving rates are substantially lower in this treatment compared to the conventional dictator game. While the social norm structure did not change in this case, as dictators were assigned randomly and did not deserve nor earn the endowment, the importance of complying with those norms has changed. In this case, there are no social consequences associated with keeping the entire endowment since no one will know who gave what. This removes the social stigma associated with the payoff- maximizing strategy, which in turn entices more people to give lower amounts.

A very similar argument can be made regarding treatments that obscured the dictator's decision using randomized response techniques (Franzen and Pointner, 2012) and treatments that used asymmetric information such that the receiver did not know where the money received came from (Dana et al., 2006). In both cases, the parameter $\gamma(\rho)$ significantly decreased as the dictator’s ability to get away with giving low rates with no social consequences was enhanced. The examples above highlight situations where our extended model can prove useful in fully explaining how interaction with social norms affects giving in dictator games.

Finally, our extended model does a good job in explaining changes in behavior driven by social framing treatments, where the wording of the task changes to either encourage or discourage giving (Ellingsen et al., 2012; Dreber et al., 2013). Consistent with Dreber et al. (2013), we argue that the effect of social frames on behavior arrives from changes in the utility function rather than changes in beliefs. However, it is possible that those treatments are changing both the social norms structure and the importance placed on social norm compliance. For instance, framing the dictator game as the "giving game" *versus* the "keeping game", as done by Dreber et al. (2013), can change the perception of the most appropriate amount to give and/or how likely dictators think they can justify low giving rates.

3.6 Conclusion

Previous investigations of giving in dictator games have reported consistent deviations from economic theory in the sense that individuals make transfers well above the optimal strategy prescribed by Nash equilibrium. A number of theoretical models have been proposed to account for this kind of behavior including several which argued for a philanthropic tendency as the driving force.

One explanation that was able to outperform the traditional philanthropic models and is robust to various experimental manipulations and findings holds compliance with social norms as the main motive governing the significant positive contributions in dictator games. This notion was supported by several studies and is advocated by many researchers as the most accurate rationalization for the observed behavior (Hoffman et al., 1996; Bolton et al., 1998; Fehr and Fischbacher, 2004; Krupka and Weber, 2013). Yet, little is known about the nature with which subjects perceive and interact with these social norms.

This study addresses an important question that provides a better understanding of the dynamic relationship through which compliance with social norms influences behavior in dictator games, and similar social settings. By varying the presence of a social stigma against selfish behavior, we were able to determine whether individuals considered adherence to social norms as a first impulse or a last resort. This was done using three treatments: 1) control, where role assignment was explicitly random; 2) *real entitlement* treatment, where role assignment was explicitly based on merit; and 3) *fake entitlement* treatment, where role assignment was implicitly random but open for interpretation.

A rigorous investigation of behavior across the three treatments provided compelling evidence that social norms are not a course of action that is impulsively sought by individuals facing a situation similar to the one in a dictator game. Instead, we observe that subjects were keen on forming an interpretation that served their own self-interest in the *fake entitlement* treatment, indicating that adherence to social norms, at least within the framework presented here, is something that individuals are forced into when they fail to justify self-centered, payoff-maximizing behavior.

The findings presented here can be useful in reconciling much of the divergence between theory and laboratory behavior. Moreover, our notion can be used to more accurately anticipate when we should observe violations of Nash equilibrium in dictator games. Our study can also prove useful as a starting point for providing charities and other fund-raising agencies with valuable recommendations that can help improve their performance. By developing a thorough understanding of the way with which social norms interact with and affect the average person's giving behavior, institutions can start developing optimal environments to enhance their efficiency and generate more donations. As a concluding remark, we reiterate the words of List (2007) that further investigations are clearly needed to unravel more of the underlying forces that shape behavior in this setting. We hope that our paper promotes further applications of this notion under different environments to provide a more complete understanding of the full extent of the role that social norms play on individual giving behavior.

CHAPTER IV

HAPPY TO TAKE SOME RISK: A MORE ACCURATE ASSESSMENT OF THE DEPENDENCE OF RISK PREFERENCES ON MOOD USING BIOMETRIC DATA

4.1 Introduction

Our mood plays an important role in determining our daily behavior. It influences how we perceive and interact with our surrounding environment. In fact, we spend the majority of our lives in a constant state of changing moods. When we go to work, make business decisions, invest in retirement, or decide what type of insurance to purchase, we seldom do so in a state of neutral affect. We often make decisions under varying positive and negative moods and it is reasonable to believe that our affective state has an influence on our decision-making process.

Although very little attention has been initially placed on investigating emotions, they have become widely recognized by researchers as a key factor affecting individual cognition and behavior. For instance, Isen (2008) has linked positive affect with enhanced cognitive flexibility, while Ifcher and Zarghamee (2011) argued that it decreases the time value for present utility (i.e., individuals experiencing a pleasant mood tend to be more patient in intertemporal decisions). Positive affect has also been shown to increase reciprocity (Kirchsteiger et al., 2006), work effort (Erez and Isen, 2005), and productivity (Erez and Isen, 2005). On the other hand, negative affect was found to increase self-perceived emotional eating (Bekker et al., 2004), willingness-to-pay for market goods (Lerner et al., 2004; Cryder et al., 2008), to decrease job satisfaction (Brief et al., 1995), time preference for present utility (Drichoutis and Nayga, 2013) and altruism in dictator and ultimatum games (Capra, 2004).

Considering the importance economists place on understanding individual decision-making under uncertainty, and the relevance of these decisions in our everyday life, a great deal of attention has been placed on investigating the effect of emotions on risk preferences (Drichoutis and Nayga, 2013; Kliger and Levy, 2003; Isen and Geva, 1987; Arkes et al., 1988; Fehr-Duda et al., 2011; Yuen and Lee, 2003). However, the mechanism through which emotions influence how individuals form decisions under risk is still a subject of debate. In fact, there is a longstanding controversy regarding the direction of the effect of positive and negative moods on risk preferences, with two opposing hypotheses.

The first hypothesis, *mood maintenance hypothesis* (MMH), argues that individuals experiencing a positive mood will act to maintain this pleasant experience. This will cause them to refrain from engaging in risky behavior in order to avoid losses that could negatively alter their current mood state. Hence, according to the MMH, positive mood increases risk-aversion and vice versa (Isen and Patrick, 1983). On the other hand, the second hypothesis, *affect generalization hypothesis* or *affect infusion model* (AIM), posits that individuals are more likely to fixate on the positive aspects of a risky situation when experiencing a positive mood. This will drive decision-makers to put a higher weight on large positive outcomes, which will ultimately lead them to choose riskier alternatives. Hence, according to the AIM, positive mood decreases risk-aversion and vice versa (Johnson and Tversky, 1983).

With completely opposite predictions, the controversy between the MMH and AIM is fueled by a large body of evidence supporting both models. While results supporting the MMH have long been reported in the literature (Isen and Patrick, 1983; Arkes et al.,1988; Mano, 1992; Nygren et al., 1996; Rusting and Nolen-Hoeksema, 1998; Kring, 2000), there are numerous studies that have strongly advocated the AIM (Lerner et al., 2004; Kugler et al., 2012; Spies et al., 1997; Nguyen and Noussair, 2014). Furthermore, some studies have produced mixed evidence in favor of both models (Drichoutis and Nayga, 2013), while others have reported an insignificant effect of mood on risk preferences (Yuen and Lee, 2003). The main purpose of this chapter is to utilize biometric data to provide a better understanding of the full extent of the effect of mood on risk-taking behavior. In doing so, we test for differences in the treatment effects under different risk preference elicitation tasks, namely, the Holt and Laury (2002) task (HL) and the Eckel Grossman (2002) task (EG). Moreover, by using facial expression analysis technology to directly observe emotions, we highlight a potential shortcoming in the traditional experimental designs used for tackling this topic. This in turn provides a more accurate test of the two hypotheses mentioned above.

The commonly adopted procedure for studying emotions in the laboratory is to conduct a three-stage design (Ifcher and Zarghamee, 2011; Drichoutis and Nayga, 2013; Treffers et al., 2012). In the first stage, the participants are induced with their respective moods based on their treatment assignment. This is usually done using short videos, reading mood inducing passages, mood-related memory elicitation, and experience of success/failure (Capra et al., 2004; Capra et al., 2010; Kirchsteiger et al., 2006). The subjects' moods are then elicited in the second stage (mood measurement stage) in order to validate the success of the mood inducement. Mood elicitation in the second stage is usually done using self-reported surveys, where the predominant survey is the Positive and Negative Affect Schedule (PANAS). In the PANAS, subjects answer a list of questions regarding the extent on a scale of 1 (very slightly or not at all) to 5 (extremely) to which they are feeling various positive and negative moods. The answers are aggregated for each subject in order to determine his valence (net positive or negative affect). Finally, subjects complete the risk task (or some other task of interest) in the third stage. We argue that this design is problematic and might result in biased estimates of the effect of mood on risk preferences. The main issue is that this procedure in its current form requires subjects to complete an additional task (mood elicitation survey) between mood inducement and risk elicitation. Considering the cognitive effort imposed by this additional task, and the fact that it is relatively lengthy relative to the short mood inducement, the subjects' induced mood might become diluted by the time they complete the survey and are ready to start the risk preference elicitation task.[10] We conjecture that this "*dilution effect*" might in turn attenuate or otherwise bias the treatment effects of interest.

In this chapter, we use facial expression analysis to test for the significance of the *dilution effect* and to help overcome this issue. While testing the effect of positive and negative moods on risk preferences, we further divide our subjects into two groups. The first group, hereafter *diluted group*, followed the conventional three-stage design described above. Conversely, the second group, hereafter *undiluted group*, completed stages 2 and 3 in the opposite order. This group was presented with the risk preference elicitation tasks (HL and EG) directly following mood inducement, after which they were asked to complete the PANAS survey. In order to maintain an accurate measure of the success of mood inducement for both groups, facial expression analysis was utilized to measure subjects' moods during mood inducement and right before they started the risk preference tasks. It is worth noting that facial recognition software has been used before in the literature (Nguyen and Noussair, 2014; Kahyaoglu and Ican, 2017). For instance, Nguyen and Noussair (2014) have used this technology to monitor subjects' facial expressions as they made choices between a safe and a risky alternative, while Kahyaoglu and Ican (2017) have used it to infer the effect of positive and negative moods on individuals' decisions in the Deal or No Deal TV show.

[10] It is also possible that having to sit through the long mood measurement survey puts subjects in a bad mood hence exacerbating the negative mood treatment while diluting the positive mood treatment.

Our results highlight the severity of the *dilution effect* and the potential of using biometric data when investigating the effect of emotions on individual cognition and behavior. First, we demonstrate this *dilution effect* in the mood measurement obtained from the facial expression analysis, where the mood for individuals in the *diluted group* was substantially attenuated immediately before they started the risk preference tasks. Furthermore, we find no significant change in the risk attitudes of the *diluted group* across treatments, contrary to the *undiluted group*, where we report a significant decrease in risk-aversion under both the positive and negative mood treatments. Finally, we find a significant difference in the results obtained from the two risk preference tasks (HL and EG), where the EG task showed no significant effect for the negative mood treatment and only a marginally significant effect for the positive mood treatment.

The rest of the chapter is organized as follows: Section 2 describes the experimental design and explains the two mood measurement techniques. Section 3 presents a simple theoretical model used to obtain point estimates of the coefficient of relative risk aversion under each treatment. Section 4 contains a discussion of the results, while section 5 highlights the main findings and concludes.

4.2 Experimental Design

A total of 187 undergraduate students from Texas A&M University were recruited to participate in this experiment, which took place at the Human Behavior Laboratory (HBL). Subjects were paid a $5 participation fee and had the chance to make additional earnings based on their decisions and the outcome of the risk preference tasks. As mentioned before, the experiment was comprised of three stages which were administered in a different order for subjects in the *diluted* and *undiluted* groups. We will start with a description of those stages, followed by a discussion of the main factors and treatments.

4.2.1 Mood Inducement Stage

The subjects were split into 3 groups, which were positive (63 subjects), neutral (63 subjects), and negative (61 subjects) mood. Each subject was presented with a three-minute video that was intended to manipulate their mood based on their respective group. Individuals in the positive affect group were presented with short clips from Mr. Bean (a classic British comedy starring the famous comedian Rowan Atkinson). Participants in the negative affect group were shown a video of animal mistreatment, while those in the neutral affect group watched an automobile driving down a road. A pilot experiment was conducted with 40 subjects to determine the most effective videos to use in this study. In the pilot experiment, subjects were asked to watch one of four videos (2 positive and 2 negative), after which they filled out the PANAS survey. Facial expressions were also recorded during the pilot experiment and were used, along with the PANAS survey, to select among those videos. Overall, the videos were selected to be similar to mood inducement videos used in the literature.

4.2.2 Mood Measurement Stage

4.2.2.1 Positive and Negative Affect Schedule (PANAS)

As mentioned before, the success of the mood inducement stage was evaluated using two different mood measurement techniques. The first was the PANAS survey, which consisted of 20 questions, each measuring the extent to which the subject is feeling a specific mood (10 positive and 10 negative moods). The positive moods used in this survey were happy, amused, enthusiastic, interested, determined, excited, inspired, strong, proud, attentive. On the other hand, the negative moods were sad, angry, afraid, upset, distressed, nervous, ashamed, guilty, irritable, hostile.

Subjects answered on a scale from 1 (very slightly or not at all) to 5 (extremely) how much they were feeling each of the above moods. The numbers reported for each category (positive and negative) are aggregated and compared to determine whether the individual is under a generally positive, negative, or neutral mood state.

4.2.2.2 Facial Recognition Technology (AFFDEX)

The second method uses the facial expression analysis software called AFFDEX (Bernin et al., 2017; Zeng et al., 2009). This technology operates at 30Hz, meaning that it generates 30 observations (or likelihood indexes) for each emotion per second. The software was adapted and configured to capture the slightest changes in facial expressions to infer the current mood the subject is experiencing. It is completely noninvasive and operates wirelessly through a webcam. AFFDEX operates on the idea of capturing emotions as expressions (Bernin et al., 2017). When subjects are placed in front of the computer screen where they will be presented with the stimuli, AFFDEX will first detect the subject's face. This is done through a standard algorithm known as Viola-Jones (Viola and Jones, 2004). Following facial recognition, AFFDEX will extract what is known as action units (AUs) through placing facial landmarks and monitoring facial muscle activity (Bernin et al., 2017). Examples of AUs include raised eye brow, nose wrinkle, brow furrow, yaw, and lip press. Extraction of AUs is done using trained support vector machines (SVMs). Once the action unites are collected, AFFDEX will run an algorithm where the action units are compared with a massive database of faces kept in the program. Modeling of prototypic emotions is then performed based on the AUs using the emotional facial action coding system, EMFACS (Eckman et al., 2002). AFFDEX then generates a likelihood index for each mood, which tells how likely the subject is experiencing that specific mood based on his facial expressions. The emotions included in the AFFDEX software are anger, sadness, fear, disgust, contempt, joy, and surprise. However, clustering methods are commonly used to discard irrelevant emotions, while combining relevant emotions into general positive and negative categories (Bernin et al., 2017). In this study, the negative mood category included anger and sadness, while the positive mood category included joy.[11]

4.2.2.3 PANAS Versus AFFDEX

While the PANAS survey is highly used in the literature, it constitutes an additional step (taking the survey) that occurs between the mood inducement and the risk task. So, although it might accurately capture the subject's mood right after the mood inducement stage, we argue that the mood state may become diluted by the time the subject finishes the survey and is ready to start the subsequent economic task of interest. Also, it requires a significant cognitive effort to answer on a scale of 1 to 5 how much one is feeling each of 20 different mood states. The cognitive load itself might act to further dilute the effect of the brief mood inducement stage. Of course, the *dilution effect* may differ depending on the mood in question (i.e., positive moods might become diluted faster than negative moods or vice versa). Conversely, the AFFDEX mood measurement technique can be done simultaneously with the mood inducement since the camera will be measuring the subjects' moods as they view the mood inducement video. Thus, it avoids the *dilution effect* problem that we conjecture is prominent in the PANAS method. Moreover, it can be used to continuously track the mood over the entire mood inducement stage rather than simply reporting the mood post inducement.

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[11] We selected these moods for the negative and positive AFFDEX indexes since they were common between the AFFDEX and PANAS survey. We also tried different combinations of the AFFDEX moods and the results did not significantly change.

4.2.3 Risk Preference Elicitation

The subjects' risk preferences were elicited using the HL and EG risk preference elicitation tasks. Since all subjects completed both risk preference tasks, the order of the tasks was randomized to control for any ordering effects. In the HL task, subjects are presented with several choice sets as shown in table 13 below. There are 10 rows, each corresponding to a choice set containing two lottery alternatives (A and B). Although the potential outcomes from both lotteries remain the same in all choice sets, the probability of each outcome changes as the subject progresses through the task. Specifically, the probability of the higher outcome increases for both lotteries. The safer lottery (A) starts with a higher expected return than the riskier lottery (B) in the first few choice sets (rows). However, as the probability on the higher outcome increases in both lotteries, the expected return of lottery B eventually surpasses that of lottery A in row 5. For each choice set, subjects are required to indicate which lottery they prefer to play, after which their risk preferences are calculated based on the point at which they make the switch from the safer lottery (A) to the riskier one (B). Clearly, the further down the table the switch happens, the more risk-averse the individual is. Also, switching to lottery B before row 5 indicates risk-seeking behavior.

The EG task is much simpler than the HL and avoids problems with inconsistent behavior (multiple switches between lotteries A and B). However, it provides coarse estimates of risk preference compare with the HL task. In this task, the subject is presented with only one choice set containing 6 lottery alternatives as shown in table 14. This means that the subject will only make one choice instead of 10. The appealing feature of this mechanism is that all the lotteries provide a 50/50 chance of getting a high or low payoff, which makes them easier to process and understand than lotteries that vary the odds of the high and low payoffs. In the EG task, the first lottery offers a sure payment of $5.6 (the high and low payoffs are the same), while lotteries 2-5 are structured to offer progressively increasing expected returns but with an increasing variance (risk) as well. The last lottery offers the same exact payoff as the 5th lottery but with a higher risk and is included to allow for detection of any risk-seekers. Based on the subject's choice, risk preferences are calculated through a comparison of the chosen lottery with the adjacent lotteries (before and after it).

Table 13. Holt-Laury Risk Task Description

Option A	Option B	Choice
\$8 if the die roll is 1 \$6.4 if the die roll is 2-10	\$15.4 if the die roll is 1 \$0.4 if the die roll is 2-10	______
\$8 if the die roll is 1-2 \$6.4 if the die roll is 3-10	\$15.4 if the die roll is 1-2 \$0.4 if the die roll is 3-10	______
\$8 if the die roll is 1-3 \$6.4 if the die roll is 4-10	\$15.4 if the die roll is 1-3 \$0.4 if the die roll is 4-10	______
\$8 if the die roll is 1-4 \$6.4 if the die roll is 5-10	\$15.4 if the die roll is 1-4 \$0.4 if the die roll is 5-10	______
\$8 if the die roll is 1-5 \$6.4 if the die roll is 6-10	\$15.4 if the die roll is 1-5 \$0.4 if the die roll is 6-10	______
\$8 if the die roll is 1-6 \$6.4 if the die roll is 7-10	\$15.4 if the die roll is 1-6 \$0.4 if the die roll is 7-10	______
\$8 if the die roll is 1-7 \$6.4 if the die roll is 8-10	\$15.4 if the die roll is 1-7 \$0.4 if the die roll is 8-10	______
\$8 if the die roll is 1-8 \$6.4 if the die roll is 9-10	\$15.4 if the die roll is 1-8 \$0.4 if the die roll is 9-10	______
\$8 if the die roll is 1-9 \$6.4 if the die roll is 10	\$15.4 if the die roll is 1-9 \$0.4 if the die roll is 10	______
\$8 if the die roll is 1-10	\$15.4 if the die roll is 1-10	______

Table 14. Eckel-Grossman Risk Task Description

Gamble (50/50 Lottery)	Low Payoff	High Payoff
Gamble 1	$5.6	$5.6
Gamble 2	$4.8	$7.2
Gamble 3	$4.0	$8.8
Gamble 4	$3.2	$10.4
Gamble 5	$2.4	$12.0
Gamble 6	$0.4	$14.0

4.2.4 Treatments

Clearly, the first factor of interest in this experiment is the mood state, which took three levels (positive, neutral, and negative). In order to be able to test for the *dilution effect* described earlier, we split subjects in each affect state into two groups. The first group, *diluted group*, performed the 3 stages in the conventional order, which was mood inducement, followed by the PANAS survey then the risk elicitation tasks. The second group, *undiluted group*, completed the second and third stages in the opposite order. This group was presented with the risk task immediately following mood inducement and completed the PANAS survey in the last stage of the experiment. Hence, a second factor of interest is the task order (*diluted* vs. *undiluted*), which means that we can think of this experimental design as a 3X2 design. A summary of the treatments is included in table 15.

Table 15. Summary of Treatments

		Mood State		
		Neutral	**Positive**	**Negative**
Task Order	**Diluted Group**	n = 32	n = 33	n = 31
	Undiluted Group	n = 31	n = 30	n = 30

4.3 Methodology

4.3.1 Structural Model

In order to obtain structural estimates for the coefficient of relative risk aversion by treatment, we adapt the methodology used in Dave et al. (2010). We assume a constant relative risk aversion (CRRA) utility function, which takes the following form:

$$U(x|r) = \frac{x^{1+r}}{1+r} \tag{30}$$

where x is the amount of money and r denotes the coefficient of relative risk-aversion. For each binary choice the subjects face in the HL and EG tasks, they assess the expected utility of each alternative i:

$$EU_i = \sum_k [p_k \times U(x_k|r)], \forall k = 1,2 \tag{31}$$

where p_k is the probability associated with payoff x_k.

If we denote by EU_A and EU_B the utility of the lotteries on the left-hand and right-hand sides respectively, then we can construct a simple probabilistic choice rule as follows:

$$Pr(Gamble\ A) = \frac{EU_A}{EU_A + EU_B} \tag{32}$$

Equation 3 forms the basis for the logistic conditional logarithmic likelihood function $l(r|Y_i)$ which can be maximized with respect to r based on the subjects' decisions (Y_i) in the HL and EG risk tasks. The parameter r can be specified as a function of treatments and individual characteristics $r = f(X\beta)$ to test for treatment effects and individual heterogeneity. The resulting modified likelihood function can be expressed as $l(r, \beta|Y_i, X_i)$.

4.3.2 Coding the Choice Data

The choices subjects made between the lotteries for each choice task in the HL and EG elicitation methods were represented as a binary choice variable Y_i for use in the structural model described above. Coding this variable for the HL task was straightforward. The variable Y_i took the value 1 if the subject chose the risky lottery A and 0 otherwise. Since each subject made 10 choices in the HL task, each had 10 observations of Y_i in this task. In order to code the decisions in the EG task in a comparable manner, we coded the data following Dave et al. (2010). Although subjects made only one choice between 6 alternatives in this task, we created 5 binary choice sets as follows:

Decision 1: Gamble 5 vs. Gamble 6
Decision 2: Gamble 4 vs. Gamble 5
Decision 3: Gamble 3 vs. Gamble 4
Decision 4: Gamble 2 vs. Gamble 3
Decision 5: Gamble 1 vs. Gamble 2

To understand how subjects' decisions are translated into the coded variable, suppose a subject chooses gamble 2 in the EG task. Obviously, this means the subject prefers gamble 2 to gamble 3 and gamble 1. But, it also implies that he prefers gamble 3 to 4, gamble 4 to 5, and gamble 5 to 6. Hence, the vector Y_i is coded as $[0, 0, 0, 0, 1]$ in this case. Similar logic can be applied to determine the binary choices associated with the other possible decisions in the EG task.

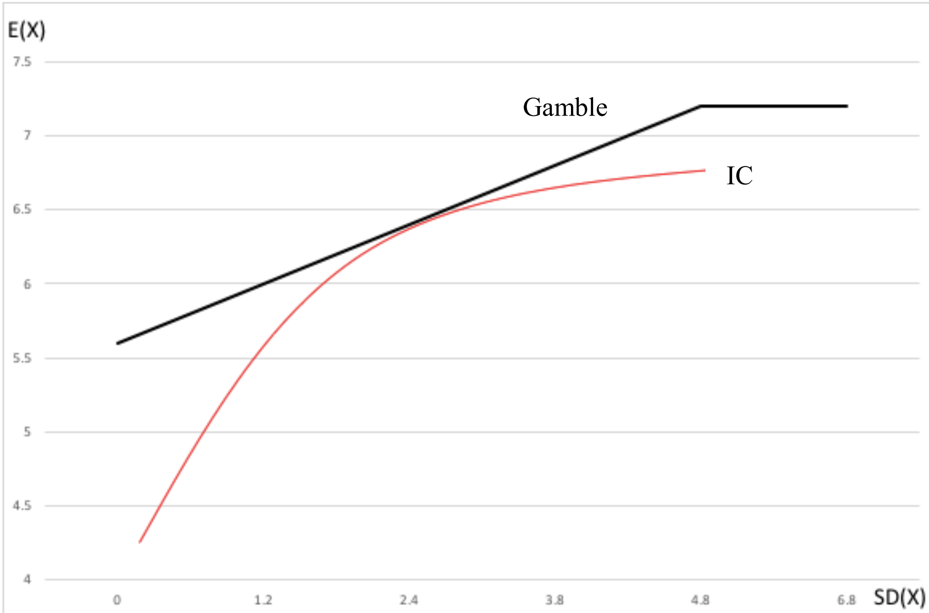

Figure 7. Individual Utility Maximizing Lottery Choice

The validity of this coding method has already been asserted by Dave et al. (2010), however, we will repeat the illustration here to further establish the reasonability of this logic. As we know, the expected value and standard deviation of the gambles in the EG task increase linearly except for gamble 6, which has the same expected value as gamble 5 and a higher standard deviation. So, if we plot the gambles on a graph with expected return on the vertical axis and standard deviation on the horizontal axis, they would follow an upward sloping line up until gamble 5, after which the line becomes flat for gamble 6, as in figure 7. Risk-averse indifference curves will be concave and upward sloping with a tangency at the most preferred gamble. If the subject picks gamble 3 for example, and assuming the indifference curves are well-behaved, this implies that gamble 2 is preferred to gamble 1, gamble 3 preferred to gamble 2 and gamble 4, gamble 4 preferred to 5, and 5 to 6. While this method imposes the assumption that individuals viewed the alternatives in the order presented above, a separate model was estimated on the EG data where this assumption was relaxed and the estimation was conditioned on the 6 lottery alternatives. The results were generally similar across those two models and indicated significant risk-aversion in the EG task.[12]

4.3.3 Hypotheses Regarding the Treatment Effects

This section formally states the different hypotheses regarding the effect of positive and negative moods on risk preferences implied by past research. We also propose new hypotheses taking the *dilution effect* into consideration and the previous finding that there are significant differences in the preference estimates obtained from the HL and EG tasks. In this framework we will suppose that the subject's mood is $\mu \in \mathbb{R}$, where it increases and decreases for positive and negative mood respectively. r_i is the relative risk aversion coefficient obtained from elicitation method i, which increases (decreases) as the subject becomes more risk-averse (risk-seeking). Also, we denote by t the time span between mood inducement and risk elicitation such that $t = 0$ if risk elicitation happens immediately following mood inducement.

Hypothesis 1 (Mood Maintenance Hypothesis)

There is a directly proportional relationship between μ *and* r*, with* $\partial r/\partial \mu > 0$.

This hypothesis is in line with research supporting the mood maintenance hypothesis, where subjects exhibit higher levels of risk aversion when experiencing a positive mood and vice versa. Under this view, the individual is assumed to care about positive mood conservation. The desire to preserve or maintain the pleasant feeling will lead the individual to refrain from engaging in any behavior that might jeopardize his current mood state. Hence, the subject will shy away from risk and will exhibit higher risk-aversion levels. On the other hand, when experiencing a

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[12] The results are available upon request.

negative mood, the individual will want to offset this unpleasant feeling and so will engage in risky behavior that might generate high winnings.

Hypothesis 2 (Affect Infusion Model)

There is a negatively proportional relationship between μ *and* r*, with* $\partial r/\partial\mu < 0$.

This hypothesis is supportive of the affect infusion model, where subjects exhibit higher risk-seeking behavior when experiencing a positive mood and vice versa. The argument is based on the idea that individuals change the way they weigh positive and negative outcomes depending on their mood. When experiencing a positive mood, individuals would be more optimistic and will overvalue higher positive outcomes. Hence, they tend to choose the riskier alternative since it carries the higher positive outcome. On the other hand, individuals will adopt a more pessimistic outlook under a negative mood and will fixate more on the negative outcome. This will drive them to shy away from the riskier alternative since it carries the higher negative outcome.

Hypothesis 3 (Unified model)

The relationship between μ *and* r *depends on the sign on* μ*, where is could be* $\partial r/\partial\mu > 0$ *if* $\mu > 0$ *and* $\partial r/\partial\mu < 0$ *for* $\mu < 0$ *or vice versa.*

This hypothesis supports the idea that both the MMH and AIM might be valid, but for different affect valences. For instance, it could be the case that individuals exhibit a higher or lower level of risk-aversion under both the positive and negative mood. Individuals might fixate on higher outcomes when experiencing a positive mood, while desiring to offset their unpleasant feeling by taking more risk when experiencing a negative mood. On the other hand, they might avoid risk to maintain their positive mood, but fixate on negative outcomes and also avoid risk under a negative mood.

Hypothesis 4 (Dilution Effect)

The relationship between μ *and* r *is a decreasing function of* t. *Hence, denoting* $\beta = \partial r/\partial\mu$ *we can write* $\partial\beta/\partial t < 0$.

This hypothesis is congruent with the *dilution effect* described earlier. Under this hypothesis, the longer the time span between mood inducement and risk elicitation the more diluted the subject becomes when reporting the risk preferences, which in turn attenuates the treatment effects towards zero.

Hypothesis 5 (Task Dependent Effects)

The relationship between μ *and* r *depends on* i*, such that* $\partial r_i/\partial\mu \neq \partial r_j/\partial\mu$ *for* $i \neq j$.

This hypothesis states that the effect of mood on risk preferences depends on the specific risk preference elicitation method used. This view is supported in the literature as it was previously shown that the coefficient of relative risk aversion differs significantly based on the method (Dave et al. 2010).

4.4 Results and Discussion

4.4.1 Analysis of Mood Inducement

We start by assessing the effectiveness of the mood inducement stage. The average likelihood indexes obtained from the AFFDEX facial expression analysis were aggregated for the positive and negative facial expressions and they are reported in table 16. Table 17 presents the results from the PANAS survey. As we can see in table 16, the negative AFFDEX likelihood index was highly significant only for subjects in the negative mood treatment, while the positive AFFDEX likelihood index was highly significant only for subjects in the positive mood treatment. As for the neutral mood treatment, as expected, they did not display highly significant positive nor negative expressions. This implies that the videos were successful in inducing the subjects with the desired mood. In fact, results from the PANAS survey generally conform with the AFFDEX measures. Although the PANAS index was positive for subjects in the negative mood treatment, it was significantly higher for the positive mood treatment. As for subjects in negative mood treatment, it is clear that the PANAS index was significantly lower than the positive and neutral mood treatments. Taking both measurements into consideration, it might be the case that the AFFDEX measurement is better suited for detecting positive as opposed to negative affect. This argument is based on the fact that the positive AFFDEX likelihood index was very high in magnitude and significance for the positive moods treatment while the negative AFFDEX likelihood index was only high in significance for the negative mood treatment.

Result 1. *Mood inducement was successful as measured by the PANAS survey and the AFFDEX facial expression analysis. However, the AFFDEX technology seems more accurate in detecting positive affect.*

Table 16. Summary of AFFDEX Measures During Mood Inducement

	Negative (Std. Error)	**Positive (Std. Error)**
Neutral (n=63)	0.362	0.073 *
	(0.264)	(0.040)
Positive (n=63)	1.069 *	17.571 ***
	(0.634)	(3.156)
Negative (n=61)	0.445 ***	0.635
	(0.154)	(0.450)

Table 17. Summary of PANAS Measure by Treatment and Dilution State

	Neutral (n=60)	Positive (61)	Negative (=60)
Overall	15.217 ***	17.951 ***	-1.617
	(0.843)	(1.119)	(1.534)
PANAS Undiluted	17.031 ***	16.424 ***	-6.097 ***
	(1.146)	(1.627)	(2.005)
PANAS Diluted	14.645 ***	19.750 ***	3.172
	(1.332)	(1.463)	(2.018)
Significance tests			
Versus Neutral	-	P=0.035	P=0.000
Across Dilution Condition	P=0.179	P=0.140	P=0.002

Next, we investigate the difference in the mood measurement between the *diluted* and *undiluted* groups to discover if there was any dilution in the mood of the former before performing the risk preference tasks. The PANAS measurement in table 17 was further broken down by dilution group. Here, “PANAS Undiluted” stands for the group that reported their mood in the survey right after the video, while “PANAS Diluted” stands for the group that had to complete the risk preference tasks before reporting their moods in the survey. It is extremely important to note that while the group that performed the survey before the risk preference tasks is defined as the *diluted* group with respect to their decisions in the risk elicitation, this definition has to be reversed when considering the subjects’ responses in the PANAS survey. Here, the group that reported their mood in the survey right after the video (PANAS Undiluted) was not diluted at the time they were taking this survey, while the other group (PANAS Diluted) was diluted at the time they took the survey because they had to sit through the risk task first. As we can see from table 17, the PANAS survey results indicate mood dilution only for the negative mood group.

In order to further analyze the mood dilution, we track the negative and positive AFFDEX indices for the negative and positive mood treatments, respectively, at the time participants watched the video and right before they started the risk preference elicitation tasks. The results are reported in table 18 and they clearly show a drastic decrease in the positive affect for the *diluted* group in the positive mood treatment. However, we can also see that the AFFDEX measure reports a decrease in the negative affect for both the *diluted* and *undiluted* groups in the negative mood treatment. We conclude that there is suggestive evidence of mood dilution for both positive and negative mood treatments.

Result 2. *We find suggestive evidence of mood dilution among the diluted group in both positive and negative mood treatments.*

Table 18. Summary of AFFDEX Measures with Dilution

	During Video (Std. Error)	Right Before Risk Tasks (Std. Error)
Positive AFFDEX for Positive Mood Group		
Undiluted	21.472 ***	21.586 ***
	(5.060)	(7.246)
Diluted	14.243 ***	0.046
	(3.926)	(0.044)
Negative AFFDEX for Negative Mood Group		
Undiluted	1.046 **	4.690
	(0.565)	(3.644)
Diluted	0.882 ***	1.324
	(0.301)	(1.135)

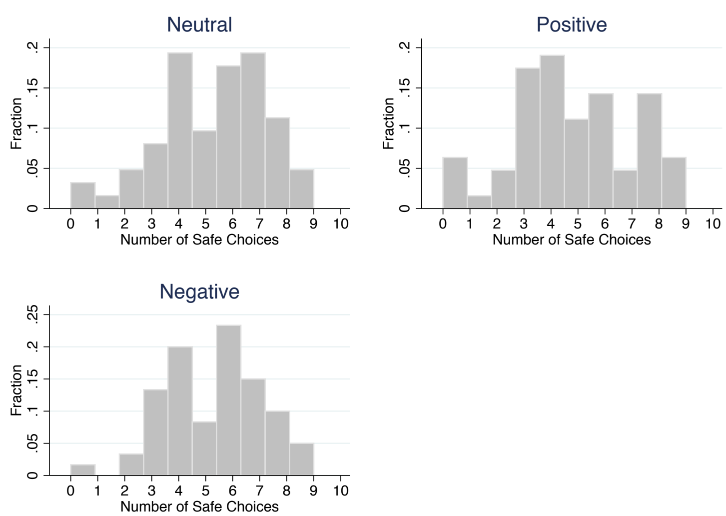
4.4.2 Analysis of Decisions in the Holt-Laury Risk Elicitation Task

Table 19 provides a breakdown for the number of safe choices in the HL task made by subjects in each mood treatment along with the range of relative risk aversion coefficients associated with each choice. The data is reported both for the overall sample of participants as well as the subsample of consistent subjects. Consistent subjects are the individuals who did not make multiple switches in the task or choose the safe lottery in the last choice set (when there was certainty of receiving the high payoff). A total of 26 out of 187 subjects displayed inconsistent behavior in the HL task. Two subjects had missing observations and were excluded from the analysis. The histograms associated with table 19 are presented in figures 8a and 8b for the overall sample and the consistent subsample respectively. First, we notice that the results for the overall sample were almost identical to the subsample of consistent subjects. Also, we can see that the results in table 19, which aggregate the *diluted* and *undiluted* groups, do not signal a significant difference in the HL decisions across treatments. The breakdown looks very similar for the neutral, positive, and negative treatments.

Table 19. Summary of Choices in Holt-Laury Risk Task

Safe Choices	Implied CRRA Range	Fraction of Choices (%) Overall Sample			Fraction of Choices (%) Consistent Subjects		
		Neutral (n=62)	Positive (n=63)	Negative (n=60)	Neutral (n=52)	Positive (n=55)	Negative (n=50)
0	r < -1.71	3.23	6.35	1.67	3.85	7.27	2.00
1	-1.71 < r < -0.95	1.61	1.59	0.00	0.00	1.82	0.00
2	-0.95 < r < -0.49	4.84	4.76	3.33	5.77	5.45	4.00
3	-0.49 < r < -0.14	8.06	17.46	13.33	9.62	16.36	14.00
4	-0.14 < r < 0.15	19.35	19.05	20.00	15.38	16.36	18.00
5	0.15 < r < 0.41	9.68	11.11	8.33	3.85	7.27	10.00
6	0.41 < r < 0.68	17.74	14.29	23.33	19.23	16.36	18.00
7	0.68 < r < 0.97	19.35	4.76	15.00	23.08	5.45	18.00
8	0.97 < r < 1.37	11.29	14.29	10.00	13.46	16.36	12.00
9-10	1.37 < r	4.84	6.35	5.00	5.77	7.27	4.00

a.



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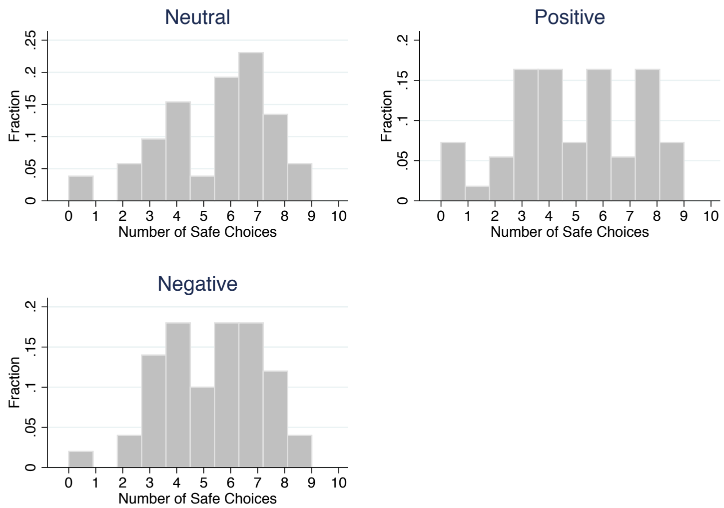


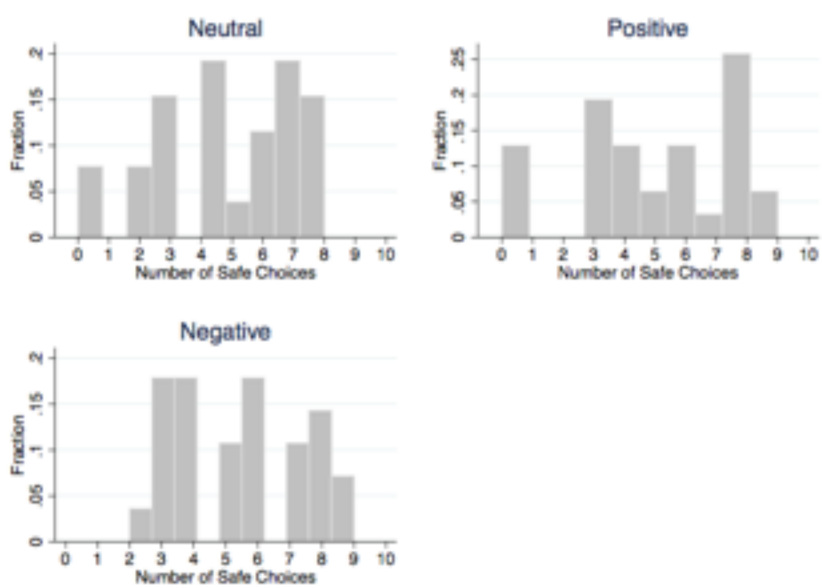
Figure 8. Histogram of Choices in Holt-Laury Risk Task. (a) overall sample. (b) sample of consistent individuals.

Next, we examine the treatment effects separately for the *diluted* and *undiluted* groups. We only consider the subsample of consistent subjects here. An analysis using the overall sample of participants yielded very similar results and is available in the appendix. The results in table 19 were further broken down by dilution group and reported in table 20. The associated histograms for the *diluted* and *undiluted* groups are shown in figures 9a and 9b respectively. While the breakdown is still very similar across treatments for the *diluted* group, we do observe a higher concentration around lower numbers of safe choices in the *undiluted* positive and negative treatments compared to the control. Although this result cannot stand on its own, it can be taken as an indication for a potentially significant treatment effect for the *undiluted* group.

Table 20. Summary of Choices in Holt-Laury Risk Task by Dilution Group

Safe Choices	Implied CRRA Range	Fraction of Choices (n) Dilution			Fraction of Choices (n) No Dilution		
		Neutral (n=26)	Positive (n=24)	Negative (n=22)	Neutral (n=26)	Positive (n=31)	Negative (n=28)
0	r < -1.71	0.00	0.00	4.55	7.69	12.90	0.00
1	-1.71 < r < -0.95	0.00	4.17	0.00	0.00	0.00	0.00
2	-0.95 < r < -0.49	3.85	12.50	4.55	7.69	0.00	3.57
3	-0.49 < r < -0.14	3.85	12.50	9.09	15.38	19.35	17.86
4	-0.14 < r < 0.15	11.54	20.83	18.18	19.23	12.90	17.86
5	0.15 < r < 0.41	3.85	8.33	9.09	3.85	6.45	10.71
6	0.41 < r < 0.68	26.92	20.83	18.18	11.54	12.90	17.86
7	0.68 < r < 0.97	26.92	8.33	27.27	19.23	3.23	10.71
8	0.97 < r < 1.37	11.54	4.17	9.09	15.38	25.81	14.29
9-10	1.37 < r	11.54	8.33	0.00	0.00	6.45	7.14

a.



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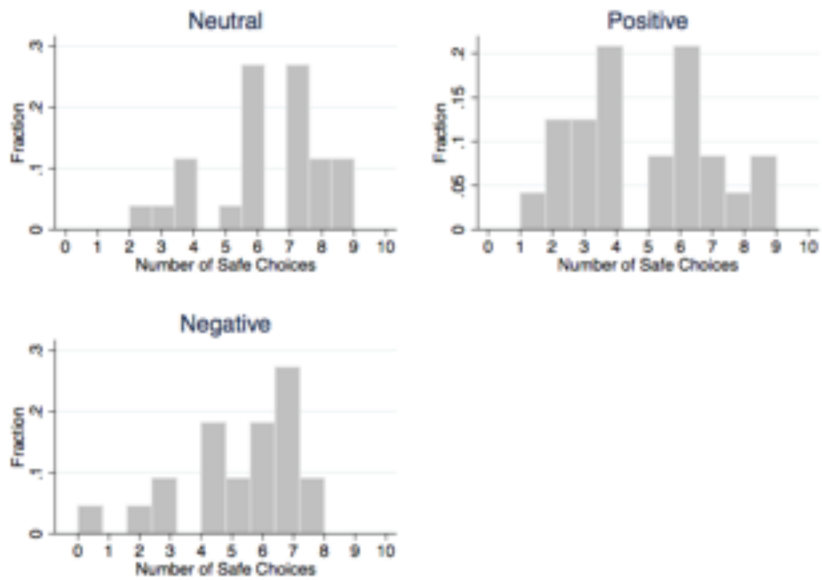

Figure 9. Histogram of Choices in HL Task. (a) diluted group. (b) undiluted group

To further test for the differential treatment effect across the *diluted* and *undiluted* groups, the average number of safe choices was calculated and reported in table 21. Here the picture becomes much clearer. As we can see, the average number of safe choices made by the positive and negative treatments is not significantly different from the control (neutral mood) for the *diluted* group. On the other hand, for the *undiluted* group, it was significantly lower at the 95% confidence level for the positive mood treatment and 90% confidence level for the negative mood treatment. It seems that among the *undiluted* group, individuals in the positive and negative mood treatments were more risk-seeking compared to the control, however, this result is not as strong for the negative mood treatment since the difference was only marginally significant for them. If one were to simply rely on the PANAS survey in the conventional three-stage experiment the conclusion would be no significant effect of mood on risk behavior. However, incorporating facial expression analysis technology allows for a more accurate assessment of the true effect of positive and negative moods on risk preferences. This leads us to our third result.

Result 3. *We find clear evidence of the dilution effect that we conjectured was inherent in the conventional three-stage design. The undiluted group displayed significantly higher risk-seeking behavior in the positive and negative mood treatments compared to the control. While the AIM clearly dominates in the positive mood domain, the evidence weakly favors the MMH in the negative mood domain.*

Table 21. Average Number of Safe Choices in HL Task by Treatment and Dilution Group

	Neutral	**Positive**	**Negative**
Overall	5.577	4.964	5.380
	(0.311)	(0.345)	(0.288)
Dilution	4.846	5.065	5.464
	(0.476)	(0.508)	(0.387)
No Dilution	6.308	4.833	5.273
	(0.354)	(0.453)	(0.442)
Significance tests (Versus Neutral)			
Overall	-	P=0.191	P=0.644
Dilution	-	P=0.758	P=0.315
No Dilution	-	P=0.013	P=0.071

4.4.3 Analysis of Decisions in the Eckel-Grossman Risk Elicitation Task

We now turn to examine the choices across treatments in the EG risk task, a breakdown of which is presented in table 22 and figure 10. As in the case with the HL task, we notice a very similar breakdown of choices across treatments when aggregating the *diluted* and *undiluted* groups. Again, in the absence of facial expression analysis to overcome the *dilution effect*, one would be led to report no impact for neither positive nor negative moods on risk preferences. Once the results are considered separately for the *diluted* and *undiluted* groups, however, they cast doubt on this conclusion. Table 23 and figure 11 report the results for the *diluted* group, while table 24 and figure 12 report the results for the *undiluted* group. The choices appear very similar across treatments for the *diluted* group, but we can observe a clustering around the higher risk choices in the *undiluted* positive treatment group.

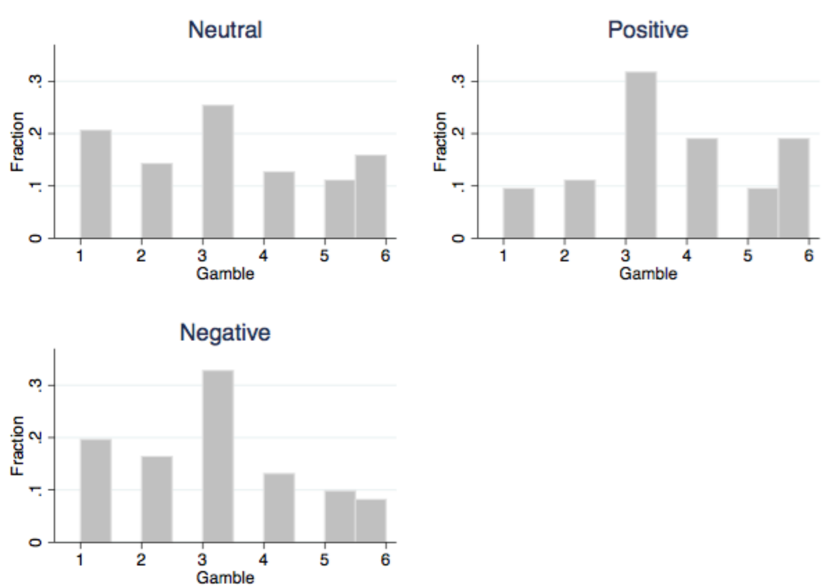

Figure 10. Histogram of Choices in Eckel-Grossman Task

Table 22. Summary of Choices in Eckel-Grossman Risk Task

Gamble (50/50)	Expected Return	Std. Dev.	Implied CRRA Range	Fraction of Choices (%)		
				Neutral (n=63)	Positive (n=63)	Negative (n=61)
1	5.6	0	3.46 < r	20.63	9.52	19.67
2	6	1.2	1.16 < r < 3.46	14.29	11.11	16.39
3	6.4	2.4	0.71 < r < 1.16	25.40	31.75	32.79
4	6.8	3.8	0.5 < r < 0.71	12.70	19.05	13.11
5	7.2	4.8	0 < r < 0.5	11.11	9.52	9.84
6	7.2	6.8	r < 0	15.87	19.05	8.20

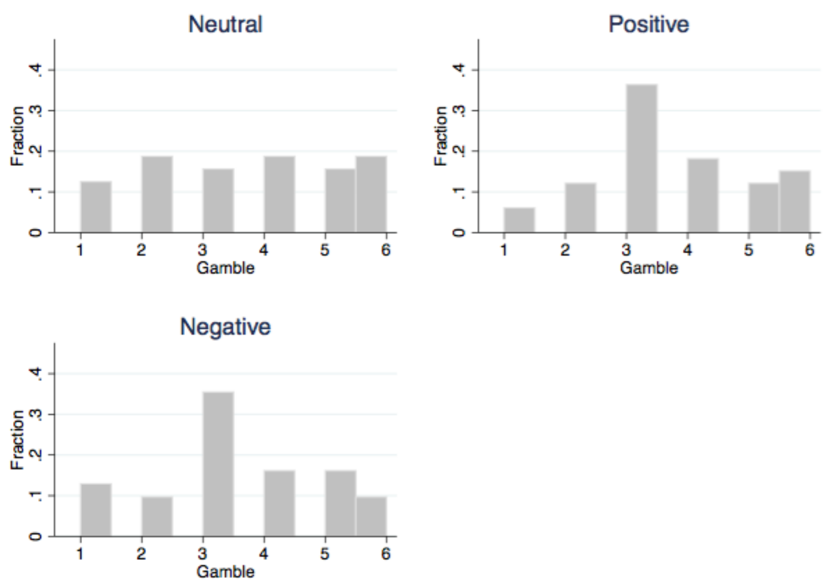

Figure 11. Histogram of Choices in Eckel-Grossman Task for Diluted Group

Table 23. Summary of Choices in Eckel-Grossman Risk Task for Diluted Group

Gamble (50/50)	Expected Return	Std. Dev.	Implied CRRA Range	Fraction of Choices (%) - Dilution		
				Neutral (n=32)	Positive (n=33)	Negative (n=31)
1	5.6	0	3.46 < r	12.5	6.06	12.90
2	6	1.2	1.16 < r < 3.46	18.75	12.12	9.68
3	6.4	2.4	0.71 < r < 1.16	15.62	36.36	35.48
4	6.8	3.8	0.5 < r < 0.71	18.75	18.18	16.13
5	7.2	4.8	0 < r < 0.5	15.62	12.12	16.13
6	7.2	6.8	r < 0	18.75	15.15	9.68

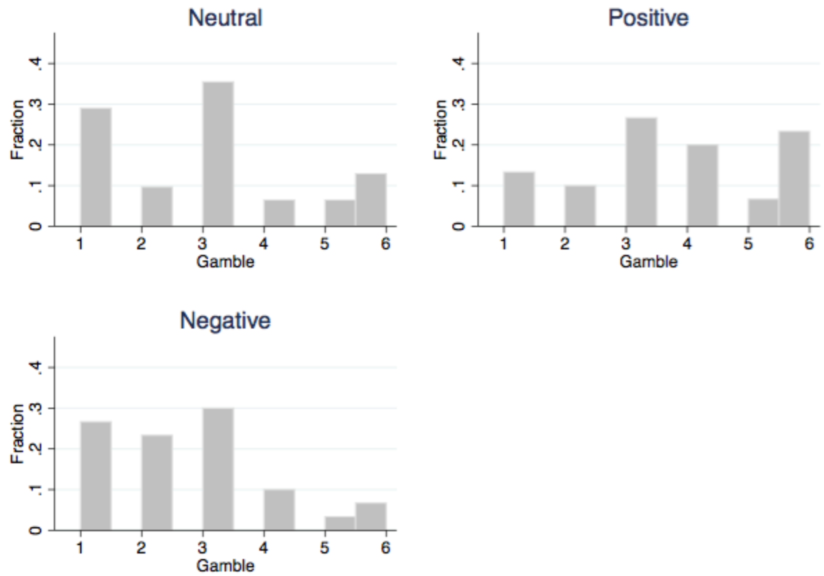

Figure 12. Histogram of Choices in Eckel-Grossman Task for Undiluted Group

Table 24. Summary of Choices in Eckel-Grossman Risk Task for Undiluted Group

Gamble (50/50)	Expected Return	Std. Dev.	Implied CRRA Range	Fraction of Choices (%) - No Dilution		
				Neutral (n=31)	Positive (n=30)	Negative (n=30)
1	5.6	0	3.46 < r	29.03	13.33	26.67
2	6	1.2	1.16 < r < 3.46	9.68	10.00	23.33
3	6.4	2.4	0.71 < r < 1.16	35.48	26.67	30.00
4	6.8	3.8	0.5 < r < 0.71	6.45	20.00	10.00
5	7.2	4.8	0 < r < 0.5	6.45	6.67	3.33
6	7.2	6.8	r < 0	12.90	23.33	6.67

Table 25 provides the average choice in the EG task made by each treatment and dilution group. Once again, we can see a sign of the *dilution effect*, but to a much lesser extent compared with the HL task. As expected, the choices were not significantly different across treatments for the *diluted* group. As for the *undiluted* group, the negative mood treatment is still not statistically different from the control, while the positive mood treatment is more risk-seeking with only marginal significance. Interestingly, although results from the HL task indicated more risk-seeking behavior for both negative and positive mood treatments compared to the control, the EG task conforms to this result only for the positive mood treatment. This means that the choice of risk preference elicitation method is important when considering the effect of mood on risk-taking behavior. The difference in the results between the HL and EG task might be due to the simplicity of the latter, or to the fact that the former task generates more refined ranges for the coefficient of relative risk aversion (Dave et al., 2010). More research is needed to investigate the factors that can possibly lead to divergent results across risk tasks in this domain. We now state our fourth result.

Result 4. *The dilution effect is still apparent in the EG task. While individuals in the positive mood treatment still display more risk-seeking behavior compared to the control, the results for the negative mood treatment are more task-dependent.*

Table 25. Average Choice in EG Task by Treatment and Dilution Group

	Neutral	**Positive**	**Negative**
Overall	3.270	3.651	3.016
	(0.216)	(0.195)	(0.192)
Dilution	3.625	3.636	3.419
	(0.300)	(0.249)	(0.265)
No Dilution	2.903	3.667	2.600
	(0.302)	(0.308)	(0.261)
Significance tests (Versus Neutral)			
Overall	-	P=0.193	P=0.383
Dilution	-	P=0.977	P=0.611
No Dilution	-	P=0.08	P=0.451

4.4.4 Structural Estimation of the Coefficient of Relative Risk Aversion

Although the analysis presented so far was informative, it is not sufficient to fully address changes in risk-taking behavior. The main reason is that the choices in the HL and EG tasks, considered in a descriptive analysis, only reveal ranges for the coefficient of relative risk aversion. In order to provide a more accurate analysis of the treatment effects and the *dilution effect* presented earlier, we now turn to estimating the model described in the methodology section. Using this model, we can not only provide point estimates for the relative risk aversion coefficient, but can model it as a function of treatments, risk tasks, dilution groups, and individual characteristics. This will enable us to make a more definitive conclusion regarding the true effect of positive and negative moods on risk preferences as well as the significance of the *dilution effect* inherent in the conventionally adopted three-stage experimental design.

Table 26 reports the results from the structural estimation with different specifications of the relative risk aversion coefficient. In column 1, the regressors were an indicator variable for the HL task, indicator variables for the positive and negative treatments, and the interaction between the treatments and the dilution groups. Column 2 included demographic variables pertaining to gender, race, and school year, while column 3 included income. Finally, column 4 was a saturated model that combined all the regressors in the first three specifications.

As can be seen, the coefficient on the indicator variable for the HL task was negative and significant across all specification, proving that the choice of risk preference elicitation method can indeed alter the results. The negative sign on this coefficient indicates that subjects were more risk-seeking in the HL compared to the EG task. Moreover, while the coefficient on the positive mood treatment was negative and significant across all specifications, the coefficient on the negative mood treatment was consistently not significant. As for the *dilution effect*, it was also only significant for the positive mood treatment. The fact that the magnitude of the coefficient for the *dilution effect* is substantial compared with the coefficient on the positive mood treatment provides further evidence that solely relying on the PANAS survey in the conventional three-stage design leads to a significant bias in the results.

Table 26. Structural Model Estimation of the CRRA Coefficient

	[1]	[2]	[3]	[4]
Variable (r)	Parameter (Std. Error)	Parameter (Std. Error)	Parameter (Std. Error)	Parameter (Std. Error)
Constant	1.605 ***	1.738 ***	1.829 ***	1.852 ***
	(0.077)	(0.132)	(0.093)	(0.138)
Holt-Laury	-1.477 ***	-1.515 ***	-1.482 ***	-1.517 ***
	(0.074)	(0.075)	(0.075)	(0.075)
Positive Diluted	-0.320 ***	-0.317 ***	-0.339 ***	-0.326 ***
	(0.104)	(0.103)	(0.104)	(0.103)
Negative Diluted	-0.041	-0.048	-0.101	-0.072
	(0.098)	(0.099)	(0.099)	(0.100)
Positive Non-Diluted	-0.265 ***	-0.253 **	-0.277 ***	-0.257 **
	(0.103)	(0.101)	(0.102)	(0.100)
Negative Non-Diluted	-0.012	-0.021	-0.068	-0.044
	(0.096)	(0.096)	(0.096)	(0.097)
Male	-	-0.240 ***	-	-0.232 ***
		(0.072)		(0.071)
School Year	-	-0.072 **	-	-0.056 *
		(0.030)		(0.031)
White	-	0.132	-	0.193 **
		(0.093)		(0.098)
African American	-	0.376 ***	-	0.351 ***
		(0.115)		(0.117)
Hispanic	-	0.224 **	-	0.192 *
		(0.101)		(0.102)
Medium Income	-	-	-0.306 ***	-0.225 **
			(0.090)	(0.092)
High Income	-	-	-0.292 ***	-0.254 ***
			(0.076)	(0.081)
Observations	2,355	2,355	2,355	2,355
Log Likelihood	-2918.98	-2901.23	-2910.15	-2895.78

Notes: Single (*), double (**), and triple (***) asterisks are used to denote significance at the 0.1, 0.05, and 0.01 levels respectively.

Regarding the demographic and socioeconomic effects, we find males to be more risk-seeking than females and upper school year students more risk-seeking compared with lower school year students. This is apparent in the fact that the coefficients on the associated indicator variables were negative and significant. Also, the coefficients on the indicator variables for White, African American, and Hispanic individuals were positive and significant implying that they are generally more risk-averse. Finally, we report a negative relationship between income-level and risk-aversion since medium- and high-income individuals were found more risk-seeking compared to low-income individuals. It is worth noting that the literature carries divergent results regarding the demographics of risk aversion (Hartog et al., 2002; Dave et al. 2010; Harrison and Rutstrom, 2008; Halek and Eisenhauer, 2001).

4.5 Conclusion

There is a vast literature on the effect of mood on individual risk preferences with two main hypotheses. While the *mood maintenance hypothesis* (MMH) predicts increased risk-aversion with positive mood and vice versa, the *affect infusion model* (AIM) carries an opposite view. In this chapter, we utilize facial expression analysis technology in order to provide a more accurate investigation of the effect of induced mood on risk preferences. Moreover, we test for a *dilution effect* which we conjecture is present in the three-stage experimental design that is commonly adopted when tackling this question. We apply two popular risk preference elicitation tasks constructed by Holt-Laury (HL) and Eckel-Grossman (EG) in order to examine potential differences in treatment effects across tasks.

We find strong evidence that positive mood stimulates more risk-seeking behavior. This result was consistent across risk preference elicitation methods, although it was more pronounced in the HL task. Furthermore, this result only became apparent when considering the *undiluted* group of individuals, who did not follow the conventional three-stage design and were not diluted prior to reporting their risk preferences. As for the effect of negative mood, it was more task-dependent. While *undiluted* individuals displayed slightly more risk-seeking behavior in the HL task, no effect was found in the EG task. We conclude that the results are more supportive of the AIM, with weak evidence favoring the MMH in the negative mood domain. Furthermore, we argue that the divergent results found in the literature might arise from the issues inherent in the conventional mood measurement methods and differences in the risk preference tasks used to measure risk preferences.

Our analysis revealed a very important issue that needs to be considered when testing the effect of mood on individual behavior in general. Solely relying on the more primitive self-reported mood measurement techniques can lead to dilution of the subjects' moods before performing the task of interest, which in turn causes a significant bias in the treatment effects. We show that biometric equipment is useful in this regard as it can circumvent this problem and provide accurate measures of the subjects' moods without the need for an intermediate task between mood inducement and preference elicitation. Our design can prove very useful for producers and other companies as it provides a stronger understanding of the relationship between mood and individual behavior. For example, some companies seek to induce customers with a certain mood state in order to stimulate higher levels of purchasing. Advertisements also commonly aim at changing subjects' moods and feelings towards certain products to increase market shares. Moreover, large supermarket chains like Walmart have started using facial recognition technology to monitor the subject's mood during the shopping experience. This can generate valuable data that will help them target specific issues leading to consumer satisfaction or dissatisfaction. Multimedia and entertainment conglomerates like Disney and Universal Studios are also using facial expression analysis technology to test the effectiveness of certain movie scenes on the viewer's mood. In conclusion, we hope this work encourages further research on the topic that can provide an even deeper understanding of the mechanism through which emotions operate to influence the individual decision-making process.

CHAPTER V

SUMMARY AND CONCLUSION

This dissertation is aimed at investigating some of the social and psychological determinants of cooperative and risk-taking behavior. Laboratory experiments and econometric models were used to investigate individual contributions to public goods, individual giving behavior in dictator games, and individual decisions under uncertainty.

Chapter I studied the interaction between high- and low-income individuals in voluntary contributions mechanisms. By varying the endowment level and marginal-per-capita-return between subjects within the same group, this chapter also addressed changes in behavior resulting from differences in the perceived relative return from the public good. Using a finite mixture model, it was found that low-income individuals behave as either *opportunists* or *free-riders*. On the other hand, high-income individuals were classified as either *selfists* or *free-riders.* While *opportunists* tried to benefit from the presence of the high-income type by stimulating higher contributions to the public good through cooperation, *selfists* were less prone to cooperation in the presence of the low-income type and their contribution levels were lower when playing with low-income individuals in the same group. Moreover, *free-riders* were far more common among the low-income type, which in some way highlights the main driver for the *selfist* tendency among high-income individuals. This work is useful in guiding policy makers through the implementation of more efficient interventions regarding the provision of public goods in neighborhoods with varying income levels. Moreover, it is important for producers considering investing in generic advertising to help increase the total demand for their commodity. Through a better understanding of the interaction between high- and low-income individuals in this setting, small and large producers can form better predictions regarding the potential benefits to be gained from generic advertisements.

Chapter II refined one of the most widely accepted structural models explaining individual giving in dictator games. The model rests on the premise that social norms drive much of the behavior in this setting. This chapter addressed the important question of whether social norms are perceived by individuals as a first impulse or last resort when making their transfer decisions. By incorporating an additional parameter into the model, and an experimental design that allowed the structural estimation of this parameter, it was found that individuals opt for a self-centered approach so long that they can justify it. In other words, individuals strictly adhere to social norms only when the environment does not allow for an alternative interpretation that can be used to break those norms. However, self-interest become more prominent when individuals can vindicate profit-maximizing behavior. This work is valuable for charities and other fund-raising organizations as it will provide them with recommendations on how to enhance their performance and generate more donations. Furthermore, it will serve to guide researchers into making better predictions of individual giving behavior by assessing the underlying social norm structure of the setting.

Chapter III utilized facial expression analysis technology to shed more light on the effect of positive and negative moods on risk preferences. In doing so, it uncovered a *dilution effect* issue that is prevalent in the conventional three-stage design that is commonly used for investigating the effect of mood on individual behavior. In this sense, this chapter highlighted the potential benefit and usefulness of biometric data in experimental and behavioral economics. While the literature carried divergent results regarding the effect of positive and negative mood on risk preference, this chapter was able to demonstrate valence-dependent effect of mood on risk preferences. In other words, the evidence supported the *affect infusion model* (AIM) in the positive mood domain and the *mood maintenance hypothesis* (MMH) in the negative mood domain. Finally, it was also found that the treatment effect, especially the negative mood treatment, depends on the risk preference elicitation method used. This work is useful for producers and other companies as it will help them better understand the forces driving individual demand for their commodities. In fact, facial expression analysis technology is already being used by large corporations like Walmart, Disney, and Universal studios to inform better ways of maintaining customer satisfaction.

REFERENCES

Anderson, Simon P., Jacob K. Goeree, and Charles A. Holt. "A theoretical analysis of altruism and decision error in public goods games." *Journal of Public Economics* 70, no. 2 (1998): 297-323.

Andreoni, James. "Cooperation in public-goods experiments: kindness or confusion?" *The American Economic Review* (1995): 891-904.

Andreoni, James. "Giving with impure altruism: Applications to charity and Ricardian equivalence." *The Journal of Political Economy* (1989): 1447-1458.

Andreoni, James. "Impure altruism and donations to public goods: A theory of warm-glow giving." *The economic journal* 100, no. 401 (1990): 464-477.

Andreoni, James. "Warm-glow versus cold-prickle: the effects of positive and negative framing on cooperation in experiments." *The Quarterly Journal of Economics* (1995): 1-21.

Andreoni, James, and B. Douglas Bernheim. "Social image and the 50–50 norm: A theoretical and experimental analysis of audience effects." *Econometrica* 77, no. 5 (2009): 1607-1636.

Andreoni, James, and John Miller. "Giving according to GARP: An experimental test of the consistency of preferences for altruism." *Econometrica* 70, no. 2 (2002): 737-753.

Arkes, Hal R., Lisa Tandy Herren, and Alice M. Isen. "The role of potential loss in the influence of affect on risk-taking behavior." *Organizational behavior and human decision processes* 42, no. 2 (1988): 181-193.

Ashley, Richard, Sheryl Ball, and Catherine Eckel. "Motives for giving: A reanalysis of two classic public goods experiments." *Southern Economic Journal* 77, no. 1 (2010): 15-26.

Bardsley, Nicholas. "Dictator game giving: altruism or artefact?" *Experimental Economics* 11, no. 2 (2008): 122-133.

Bardsley, Nicholas. "Interpersonal interaction and economic theory: the case of public goods." *Annals of Public and Cooperative Economics* 71, no. 2 (2000): 191-228.

Bardsley, Nicholas, and Peter G. Moffatt. "The experimetrics of public goods: Inferring motivations from contributions." *Theory and Decision* 62, no. 2 (2007): 161-193.

Becker, Gary. "A theory of social interactions." *Journal of Political Economy* (1974): 82 (6), 1063 – 1093.

Bekker, Marrie HJ, Carola van de Meerendonk, and Jessica Mollerus. "Effects of negative mood induction and impulsivity on self-perceived emotional eating." *International Journal of Eating Disorders* 36, no. 4 (2004): 461-469.

Bergstrom, Theodore, Lawrence Blume, and Hal Varian. “On the private provision of public goods.” *Journal of public economics* 29, no. 1 (1986): 25-49.

Bernin, Arne, Larissa Müller, Sobin Ghose, Kai von Luck, Christos Grecos, Qi Wang, and Florian Vogt. “Towards more robust automatic facial expression recognition in smart environments.” In *Proceedings of the 10th International Conference on PErvasive Technologies Related to Assistive Environments*, pp. 37-44. ACM, 2017.

Bolton, Gary E., Elena Katok, and Rami Zwick. “Dictator game giving: Rules of fairness versus acts of kindness.” *International journal of game theory* 27, no. 2 (1998): 269-299.

Brester, Gary W., and Ted C. Schroeder. “The impacts of brand and generic advertising on meat demand.” *American Journal of Agricultural Economics* 77, no. 4 (1995): 969-979.

Brief, Arthur P., Ann Houston Butcher, and Loriann Roberson. “Cookies, disposition, and job attitudes: The effects of positive mood-inducing events and negative affectivity on job satisfaction in a field experiment.” *Organizational behavior and human decision processes* 62, no. 1 (1995): 55-62.

Bolton, Gary E., and Axel Ockenfels. “ERC: A theory of equity, reciprocity, and competition.” *American economic review* (2000): 166-193.

Broberg, Tomas, Tore Ellingsen, and Magnus Johannesson. “Is generosity involuntary?” *Economics Letters* 94, no. 1 (2007): 32-37.

Buckley, Edward, and Rachel Croson. “Income and wealth heterogeneity in the voluntary provision of linear public goods.” *Journal of Public Economics* 90, no. 4 (2006): 935-955.

Cappelen, A. W., U. H. Nielsen, E. O. Sorensen, B. Tungodden, and J.-R. Tyran (2013). “Give and take in dictator games.” *Economics Letters* 118 (2), 280-283.

Capra, Mónica C. “Mood-driven behavior in strategic interactions.” *American Economic Review* 94, no. 2 (2004): 367-372.

Capra, C. Monica, Kelli F. Lanier, and Shireen Meer. “The effects of induced mood on bidding in random nth-price auctions.” *Journal of Economic Behavior & Organization* 75, no. 2 (2010): 223-234.

Cardenas, Juan Camilo, John Stranlund, and Cleve Willis. “Economic inequality and burden-sharing in the provision of local environmental quality.” *Ecological economics* 40, no. 3 (2002): 379-395.

Chan, Kenneth S., Stuart Mestelman, Rob Moir, and R. Andrew Muller. “The voluntary provision of public goods under varying income distributions.” *Canadian Journal of Economics* (1996): 54-69.

Chan, Kenneth S., Stuart Mestelman, Robert Moir, and R. Andrew Muller. "Heterogeneity and the voluntary provision of public goods." *Experimental Economics* 2, no. 1 (1999): 5-30.

Cherry, Todd L., Peter Frykblom, and Jason F. Shogren. "Hardnose the dictator." *American Economic Review* 92, no. 4 (2002): 1218-1221.

Crespi, John M. "The generic advertising controversy: how did we get here and where are we going?" *Review of Agricultural Economics* 25, no. 2 (2003): 294-315.

Crespi, John M., and Roger A. McEowen. "The constitutionality of generic advertising checkoff programs." *Choices* 21, no. 2 (2006): 61-65.

Croson, Rachel TA. "Theories of commitment, altruism and reciprocity: Evidence from linear public goods games." *Economic Inquiry* 45, no. 2 (2007): 199-216.

Cryder, Cynthia E., Jennifer S. Lerner, James J. Gross, and Ronald E. Dahl. "Misery is not miserly: Sad and self-focused individuals spend more." *Psychological science* 19, no. 6 (2008): 525-530.

Dana, Jason, Daylian M. Cain, and Robyn M. Dawes. "What you don't know won't hurt me: Costly (but quiet) exit in dictator games." *Organizational Behavior and human decision Processes* 100, no. 2 (2006): 193-201.

Dave, Chetan, Catherine C. Eckel, Cathleen A. Johnson, and Christian Rojas. "Eliciting risk preferences: When is simple better?" *Journal of Risk and Uncertainty* 41, no. 3 (2010): 219-243.

Dreber, Anna, Tore Ellingsen, Magnus Johannesson, and David G. Rand. "Do people care about social context? Framing effects in dictator games." *Experimental Economics* 16, no. 3 (2013): 349-371.

Drichoutis, Andreas C., and Rodolfo M. Nayga Jr. "Eliciting risk and time preferences under induced mood states." *The Journal of Socio-Economics* 45 (2013): 18-27.

Eckel, Catherine C., Philip J. Grossman, and Rachel M. Johnston. "An experimental test of the crowding out hypothesis." *Journal of Public Economics* 89, no. 8 (2005): 1543-1560.

Eckel, Catherine C., and Philip J. Grossman. "Sex differences and statistical stereotyping in attitudes toward financial risk." *Evolution and human behavior* 23, no. 4 (2002): 281-295.

Ekman, P., W. V. Friesen, and J. Hager. "Emotional Facial Action Coding System. Manual and Investigators Guide." (2002).

Eichenberger, Reiner, and Felix Oberholzer-Gee. "Rational moralists: The role of fairness in democratic economic politics." *Public Choice* 94, no. 1-2 (1998): 191-210.

Ellingsen, Tore, Magnus Johannesson, Johanna Mollerstrom, and Sara Munkhammar. "Social framing effects: Preferences or beliefs?" *Games and Economic Behavior* 76, no. 1 (2012): 117-130.

Engel, Christoph. "Dictator games: A meta study." *Experimental Economics* 14, no. 4 (2011): 583-610.

Engelmann, Dirk, and Martin Strobel. "Inequality aversion, efficiency, and maximin preferences in simple distribution experiments." *American economic review* 94, no. 4 (2004): 857-869.

Erez, Amir, and Alice M. Isen. "The influence of positive affect on the components of expectancy motivation." *Journal of Applied psychology* 87, no. 6 (2002): 1055.

Fehr, Ernst, and Urs Fischbacher. "Third-party punishment and social norms." *Evolution and human behavior* 25, no. 2 (2004): 63-87.

Fehr, Ernst, Michael Naef, and Klaus M. Schmidt. "Inequality aversion, efficiency, and maximin preferences in simple distribution experiments: Comment." *American Economic Review* 96, no. 5 (2006): 1912-1917.

Fehr, Ernst, and Simon Gächter. "Altruistic punishment in humans." *Nature* 415, no. 6868 (2002): 137-140.

Fehr, Ernst, and Klaus M. Schmidt. "A theory of fairness, competition, and cooperation." *The quarterly journal of economics* 114, no. 3 (1999): 817-868.

Fehr-Duda, Helga, Thomas Epper, Adrian Bruhin, and Renate Schubert. "Risk and rationality: The effects of mood and decision rules on probability weighting." *Journal of Economic Behavior & Organization* 78, no. 1-2 (2011): 14-24.

Forker, O. D., and Ronald W. Ward. "Generic advertising: a marketing strategy for farmer groups." *The... Yearbook of agriculture (USA)* (1988).

Franzen, Axel, and Sonja Pointner. "Anonymity in the dictator game revisited." *Journal of Economic Behavior & Organization* 81, no. 1 (2012): 74-81.

Frey, Bruno S., and Iris Bohnet. "Institutions affect fairness: Experimental investigations." *Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift für die gesamte Staatswissenschaft* (1995): 286-303.

Fischbacher, Urs, Simon Gächter, and Ernst Fehr. "Are people conditionally cooperative? Evidence from a public goods experiment." *Economics letters* 71, no. 3 (2001): 397-404.

Fischbacher, Urs. "z-Tree: Zurich toolbox for ready-made economic experiments." Experimental economics 10, no. 2 (2007): 171-178.

Fischbacher, Urs, and Simon Gächter. “Social preferences, beliefs, and the dynamics of free riding in public goods experiments.” *The American economic review* 100, no. 1 (2010): 541-556.

Fisher, Joseph, R. Mark Isaac, Jeffrey W. Schatzberg, and James M. Walker. “Heterogenous demand for public goods: Behavior in the voluntary contributions mechanism.” *Public Choice* 85, no. 3-4 (1995): 249-266.

Halek, Martin, and Joseph G. Eisenhauer. “Demography of risk aversion.” *Journal of Risk and Insurance* (2001): 1-24.

Hamilton, Stephen F., Timothy J. Richards, and Kyle W. Stiegert. “How does advertising affect market performance? The case of generic advertising.” In *2009 Annual Meeting, July 26-28, 2009, Milwaukee, Wisconsin*, no. 49187. Agricultural and Applied Economics Association, 2009.

Harrison, Glenn W., and E. Elisabet Rutström. “Risk aversion in the laboratory.” In *Risk aversion in experiments*, pp. 41-196. Emerald Group Publishing Limited, 2008.

Hartog, Joop, Ada Ferrer-i-Carbonell, and Nicole Jonker. “Linking measured risk aversion to individual characteristics.” *Kyklos* 55, no. 1 (2002): 3-26.

Hoffman, Elizabeth, Kevin McCabe, Keith Shachat, and Vernon Smith. “Preferences, property rights, and anonymity in bargaining games.” *Games and Economic behavior* 7, no. 3 (1994): 346-380.

Hoffman, Elizabeth, Kevin McCabe, and Vernon L. Smith. “Social distance and other-regarding behavior in dictator games.” *The American Economic Review* 86, no. 3 (1996): 653-660.

Holt, Charles A., and Susan K. Laury. “Risk aversion and incentive effects.” *American economic review* 92, no. 5 (2002): 1644-1655.

Ifcher, John, and Homa Zarghamee. “Happiness and time preference: The effect of positive affect in a random-assignment experiment.” *American Economic Review* 101, no. 7 (2011): 3109-29.

Isaac, R. Mark, and James M. Walker. “Communication and free-riding behavior: The voluntary contribution mechanism.” *Economic inquiry* 26, no. 4 (1988): 585-608.

Isaac, R. Mark, and James M. Walker. “Group size effects in public goods provision: The voluntary contributions mechanism.” *The Quarterly Journal of Economics* (1988): 179-199.

Isaac, R. Mark, James M. Walker, and Arlington W. Williams. “Group size and the voluntary provision of public goods: Experimental evidence utilizing large groups.” *Journal of Public Economics* 54, no. 1 (1994): 1-36.

Isen, Alice M. “Some ways in which positive affect influences decision making and problem solving.” *Handbook of emotions* 3 (2008): 548-573.

Isen, Alice M., and Nehemia Geva. "The influence of positive affect on acceptable level of risk: The person with a large canoe has a large worry." *Organizational Behavior and Human Decision Processes* 39, no. 2 (1987): 145-154.

Isen, Alice M., and Robert Patrick. "The effect of positive feelings on risk taking: When the chips are down." *Organizational behavior and human performance* 31, no. 2 (1983): 194-202.

Johnson, Eric J., and Amos Tversky. "Affect, generalization, and the perception of risk." *Journal of personality and social psychology* 45, no. 1 (1983): 20.

Kachelmeier, Steven J., and Mohamed Shehata. "Internal auditing and voluntary cooperation in firms: A cross-cultural experiment." *Accounting Review* (1997): 407-431.

Kahneman, Daniel, and Jack L. Knetsch. "Valuing public goods: the purchase of moral satisfaction." *Journal of environmental economics and management* 22, no. 1 (1992): 57-70.

Kahyaoglu, Mehmet Burak, and Özgür Ican. "Risk Aversion and Emotions in DoND." *International Journal of Economics and Finance* 9, no. 1 (2016): 32.

Kaiser, Harry M., Olan D. Forker, John Lenz, and Chin-Hwa Sun. "Evaluating generic dairy advertising impacts on retail, wholesale, and farm milk markets." *Journal of Agricultural Economics Research* 44, no. 4 (1994): 3-17.

Keser, Claudia, and Frans Van Winden. "Conditional cooperation and voluntary contributions to public goods." *The Scandinavian Journal of Economics* 102, no. 1 (2000): 23-39.

Kliger, Doron, and Ori Levy. "Mood-induced variation in risk preferences." *Journal of economic behavior & organization* 52, no. 4 (2003): 573-584.

Kirchsteiger, Georg, Luca Rigotti, and Aldo Rustichini. "Your morals might be your moods." *Journal of Economic Behavior & Organization* 59, no. 2 (2006): 155-172.

Koch, Alexander K., and Hans-Theo Normann. "Giving in dictator games: Regard for others or regard by others?" *Southern Economic Journal* (2008): 223-231.

Kosfeld, Michael, Akira Okada, and Arno Riedl. "Institution formation in public goods games." *The American Economic Review* 99, no. 4 (2009): 1335-1355.

Krupka, Erin L., and Roberto A. Weber. "Identifying social norms using coordination games: Why does dictator game sharing vary?" *Journal of the European Economic Association* 11, no. 3 (2013): 495-524.

Kring A.M. Gender and Anger. In A.H. Fischer (Ed.), "Gender and emotion: Social psychological perspectives." *Studies in emotion and social interaction*. Second series, (2000): 211-231.

Kugler, Tamar, Terry Connolly, and Lisa D. Ordóñez. "Emotion, decision, and risk: Betting on gambles versus betting on people." *Journal of Behavioral Decision Making* 25, no. 2 (2012): 123-134.

Lerner, Jennifer S., Deborah A. Small, and George Loewenstein. "Heart strings and purse strings: Carryover effects of emotions on economic decisions." *Psychological science* 15, no. 5 (2004): 337-341.

Levine, David K. "Modeling altruism and spitefulness in experiments." *Review of economic dynamics* 1, no. 3 (1998): 593-622.

List, John A. "On the interpretation of giving in dictator games." *Journal of Political economy* 115, no. 3 (2007): 482-493.

List, John A., Azeem M. Shaikh, and Yang Xu. "Multiple hypothesis testing in experimental economics." No. w21875. *National Bureau of Economic Research*, 2016.

List, John A., and Todd L. Cherry. "Examining the role of fairness in high stakes allocation decisions." *Journal of Economic Behavior & Organization* 65, no. 1 (2008): 1-8.

Loomes, Graham, Peter G. Moffatt, and Robert Sugden. "A microeconometric test of alternative stochastic theories of risky choice." *Journal of risk and Uncertainty* 24, no. 2 (2002): 103-130.

Mano, Haim. "Judgments under distress: Assessing the role of unpleasantness and arousal in judgment formation." *Organizational Behavior and Human Decision Processes* 52, no. 2 (1992): 216-245.

Merlino, Luca Paolo, and Kinateder Markus. "Public Goods in Endogenous Networks." *American Economic Journal: Microeconomics* (2017): forthcoming.

Messer, Kent, Harry M. Kaiser, and William Schulze. "The Problem of Generic Advertising: An Experimental Analysis." *Department of Applied Economics and Management, Cornell University* (2004).

Messer, Kent D., Harry M. Kaiser, and William D. Schulze. "The problem of free riding in voluntary generic advertising: parallelism and possible solutions from the lab." *American Journal of Agricultural Economics* 90, no. 2 (2008): 540-552.

Nguyen, Yen, and Charles N. Noussair. "Risk aversion and emotions." *Pacific economic review* 19, no. 3 (2014): 296-312.

Nygren, Thomas E., Alice M. Isen, Pamela J. Taylor, and Jessica Dulin. "The influence of positive affect on the decision rule in risk situations: Focus on outcome (and especially avoidance of loss) rather than probability." *Organizational behavior and human decision processes* 66, no. 1 (1996): 59-72.

Oxoby, Robert J., and John Spraggon. "Mine and yours: Property rights in dictator games." *Journal of Economic Behavior & Organization* 65, no. 3-4 (2008): 703-713.

Palfrey, Thomas R., and Jeffrey E. Prisbrey. "Anomalous behavior in public goods experiments: How much and why?" *The American Economic Review* (1997): 829-846.

Park, Eun-Soo. "Warm-glow versus cold-prickle: a further experimental study of framing effects on free-riding." *Journal of Economic Behavior & Organization* 43, no. 4 (2000): 405-421.

Rigdon, Mary, Keiko Ishii, Motoki Watabe, and Shinobu Kitayama. "Minimal social cues in the dictator game." *Journal of Economic Psychology* 30, no. 3 (2009): 358-367.

Rusting, Cheryl L., and Susan Nolen-Hoeksema. "Regulating responses to anger: effects of rumination and distraction on angry mood." *Journal of personality and social psychology* 74, no. 3 (1998): 790.

Schurter, Karl, and Bart J. Wilson. "Justice and fairness in the dictator game." *Southern Economic Journal* 76, no. 1 (2009): 130-145.

Schurter, Karl, and Bart J. Wilson. "Justice and fairness in the dictator game." *Southern Economic Journal* 76, no. 1 (2009): 130-145.

Spies, K., F. W. Hesse, and F. Brandes. "Influence of positive mood on risk-taking behavior." *Psychologische beitrage* 39 (1997): 216-228.

Sugden, Robert. "Reciprocity: the supply of public goods through voluntary contributions." *The Economic Journal* 94, no. 376 (1984): 772-787.

Treffers, Theresa, Philipp Koellinger, and Arnold Oskar Picot. "In the Mood for Risk? A Random-Assignment Experiment Addressing the Effects of Moods on Risk Preferences." (2012).

Viola, Paul, and Michael J. Jones. "Robust real-time face detection." *International journal of computer vision* 57, no. 2 (2004): 137-154.

Ward, Ron W. "Understanding the US generic advertising system and its role in information management among commodities and food systems." *International Journal on Food System Dynamics* 1, no. 3 (2010): 204-211.

Williams, Gary W., Oral Capps Jr, and David A. Bessler. "Florida orange grower returns from orange juice advertising." *TAMRC Consumer and Product Research Report No. CP-01-04, Department of Agricultural Economics, Texas A&M University* (2004).

Yuen, Kenneth SL, and Tatia MC Lee. "Could mood state affect risk-taking decisions?" *Journal of affective disorders* 75, no. 1 (2003): 11-18.

Zeng, Zhihong, Maja Pantic, Glenn I. Roisman, and Thomas S. Huang. "A survey of affect recognition methods: Audio, visual, and spontaneous expressions." *IEEE transactions on pattern analysis and machine intelligence* 31, no. 1 (2009): 39-58.

Zheng, Yuqing, Talia Bar, and Harry M. Kaiser. "Generic advertising in an asymmetric Cournot oligopoly." *American Journal of Agricultural Economics* 92, no. 3 (2010): 740-754.

APPENDIX A

A1. Experimental Instructions for Public Goods Experiment

The following instructions were computerized using Z-tree software.

SCREEN 1: General Instructions

Welcome! Thank you for participating in today's session!

You will receive a $5 show-up fee for your participation in this experiment. You may receive additional payments depending on the outcomes of the experiment.

As a reminder before we start today's session, your participation is completely voluntary. At any time, you may elect to end your participation. However, in order to receive any monetary payments, you must complete the whole session. All information collected today will be kept confidential and will not be used for any purpose other than this research.

Before you begin, please make sure that your cellphone is turned off and all of your belongings are placed beside you on the floor. Please remain quiet and keep your eyes on your screen for the duration of the experiment. We expect and appreciate your cooperation.

If you have any questions please raise your hand and a session monitor will come to assist you, otherwise please press the continue button below:

SCREEN 2: Instructions for Public Goods Game

This study is aimed at understanding individual decision making in interactive settings. The experiment consists of 2 practice rounds followed by 10 real rounds. In each round, you will be randomly placed in a group of participants, where each participant is required to make an investment decision. You payoff in each round will depend on the investment decisions that you and the other 3 members of your group make in that round.

The instructions are simple. If you follow them carefully and make good investment decisions you can earn a considerable amount of money from this experiment.

One of the 10 real rounds will be chosen randomly as the binding round to determine the payments. You will be paid, in cash, based on your earnings in the binding round.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 3: Instructions for Public Goods Game Continued – Treatments 1 & 2

You will participate in a total of 12 rounds (2 practice and 10 real). In each round, you will be randomly assigned to a group of 4 members. Each member will be endowed with 750 tokens (250 for low-income individuals) and must decide how he wants to divide those tokens between two accounts:

1) Private account
2) Group account

The composition of your group will change every round. Each round, you will be randomly reassigned to a new group of 4 members. At no point in the experiment will the identities of the other group members be revealed to you, nor will your identity be revealed to them. In other words, the group members will remain anonymous to one another.

You will be endowed with 750 tokens (250 for low-income individuaks) in every period and must decide how many tokens to invest in the private account and how many tokens to invest in the public account. Information about the two accounts is elaborated in the next screen.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 3: Instructions for Public Goods Game Continued – Treatments 3 & 4

You will participate in a total of 12 rounds (2 practice and 10 real). In each round, you will be randomly assigned to a group of 4 members. Each member will be endowed with a certain amount of tokens (between 100 and 900) and must decide how he wants to divide those tokens between two accounts:

1) Private account
2) Group account

The composition of your group will change every round. Each round, you will be randomly reassigned to a new group of 4 members. At no point in the experiment will the identities of the other group members be revealed to you, nor will your identity be revealed to them. In other words, the group members will remain anonymous to one another.

You will be endowed with the same amount of tokens in every period and must decide how many tokens to invest in the private account and how many tokens to invest in the public account.

Information about the two accounts is elaborated in the next screen. You will not know the number of tokens that each of the other members of your group was endowed with. Each member will only know his own endowment and the average endowment of the group. your endowment in ever round is 750 tokens (250 for low-income individuals) and the average endowment of your group in every round is 500 tokens.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 4: Instructions for Public Goods Game Continued.

Private Account:

Every token you invest in the private account will yield you a return of one cent. The other members in your group will earn nothing from your investment in the private account. Below are a few examples to illustrate:

Example 1: Suppose you choose to invest 200 tokens in the private account. Then you will get 200 cents from this account and the other members of your group will not be affected.

Example 2: Suppose you choose to invest 100 tokens in the private account. Then you will get 100 cents from this account and the other members of your group will not be affected.

Example 3: Suppose you choose to invest 0 tokens in the private account. Then you will get 0 cents from this account and the other members of your group will not be affected.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 5: Instructions for Public Goods Game Continued – Treatment 1 & 2

<u>Public Account:</u>

Every token you invest in the public account will yield a return of half a cent to each member of your group. Also, every token that any of the other members of your group invest in the public account will yield a return of half a cent to each member of your group. This means that your return from the public account will depend on the total number of tokens that you and the other members of your group invest in this account. The more the group invests in the public account, the greater the return to each member of the group. Below are a few examples to illustrate:

Example 1: Suppose you invest 0 tokens in the public account and the other five members of your group invest a total of 400 tokens in the public account. Then the total number of tokens invested by your group in the public account is 400 which means that every member of your group earns 400X0.5=200 cents from the public account.

Example 2: Suppose you invest 100 tokens in the public account and the other five members of your group invest a total of 0 tokens in the public account. Then the total number of tokens invested by your group in the public account is 100 which means that every member of your group earns 100X0.5=50 cents from the public account.

Example 1: Suppose you invest 200 tokens in the public account and the other five members of your group invest a total of 300 tokens in the public account. Then the total number of tokens invested by your group in the public account is 500 which means that every member of your group earns 500X0.5=250 cents from the public account.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 5: Instructions for Public Goods Game Continued – Treatment 3

Public Account:

Every token you invest in the public account will yield a return to each member of your group. Also, every token that any of the other members of your group invest in the public account will yield a return to each member of your group. This means that your return from the public account will depend on the total number of tokens that you and the other members of your group invest in this account. The more the group invests in the public account, the greater the return to each member of the group.

Each member's return from every token invested in the public account is directly proportional to his endowment and is equal in cents to 0.01X(the member's endowment of tokens). This means that the higher your endowment, the higher the return that you get from each token that you or any of your group members invest in the public account. So for example if your endowment is 300 tokens then you get 0.30 cents from every token that your group invests in the public account, while if your endowment is 600 tokens then you get 0.60 cents from every token that your group invests in the public account. Since your endowment of tokens if 750 (250 for low-income individuals), you will receive 0.75 cents (0.25 for low-income individuals) from every token that you or any of your group members invest in the public account. Below are a few examples to illustrate:

Example 1: Suppose you invest 0 tokens in the public account and the other five members of your group invest a total of 400 tokens in the public account. Then the total number of tokens invested by your group in the public account is 400 which means that every member of your group earns 400X0.75=300 cents from the public account.

Example 2: Suppose you invest 100 tokens in the public account and the other five members of your group invest a total of 0 tokens in the public account. Then the total number of tokens invested by your group in the public account is 100 which means that every member of your group earns 100X0.75=75 cents from the public account.

Example 1: Suppose you invest 200 tokens in the public account and the other five members of your group invest a total of 300 tokens in the public account. Then the total number of tokens invested by your group in the public account is 500 which means that every member of your group earns 500X0.75=375 cents from the public account.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 5: Instructions for Public Goods Game Continued – Treatment 4

Public Account:

Every token you invest in the public account will yield a return to each member of your group. Also, every token that any of the other members of your group invest in the public account will yield a return to each member of your group. This means that your return from the public account will depend on the total number of tokens that you and the other members of your group invest in this account. The more the group invests in the public account, the greater the return to each member of the group.

Each member's return from every token invested in the public account is inversely proportional to his endowment and is equal in cents to 0.01X(1000-the member's endowment of tokens). This means that the higher your endowment, the lower the return that you get from each token that you or any of your group members invest in the public account. So for example if your endowment is 300 tokens then you get 0.70 cents from every token that your group invests in the public account, while if your endowment is 800 tokens then you get 0.20 cents from every token your group invests in the public account. Since your endowment of tokens if 750 (250 for low-income individuals), you will receive 0.25 cents (0.75 for low-income individuals) from every token that you or any of your group members invest in the public account. Below are a few examples to illustrate:

Example 1: Suppose you invest 0 tokens in the public account and the other five members of your group invest a total of 400 tokens in the public account. Then the total number of tokens invested by your group in the public account is 400 which means that every member of your group earns 400X0.25=100 cents from the public account.

Example 2: Suppose you invest 100 tokens in the public account and the other five members of your group invest a total of 0 tokens in the public account. Then the total number of tokens invested by your group in the public account is 100 which means that every member of your group earns 100X0.25=25 cents from the public account.

Example 1: Suppose you invest 200 tokens in the public account and the other five members of your group invest a total of 300 tokens in the public account. Then the total number of tokens invested by your group in the public account is 500 which means that every member of your group earns 500X0.25=125 cents from the public account.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 6: Instructions for Public Goods Game Continued.

Your decisions and earnings in every period are confidential! This means that you will not be given information about the investment decisions or earnings of any of your group members, nor will they be given information about your investment decisions or earnings. So you must make your decision without knowing what the other members in your group are deciding. After each period, the only information you will be given is

- Number of tokens you invested in the public account
- Total number of tokens invested by your group (including you) in the public account
- Your earnings for the round

At the end of today's session, one of the 10 real rounds will be randomly chosen as the binding round. You will be paid based on your earnings in this binding round.

Please raise your hand if you have any questions, otherwise please press the continue button below.

SCREEN 7: Decision Input – Practice Round

This is round 1 of the 2 practice rounds. The decisions you make in the practice rounds are hypothetical. Those rounds are only intended to familiarize you with how your investment decisions and the investment decisions of the other members in your group determine your payment for the round.

In the two boxes below, please enter the number of tokens you would like to invest in the private and public accounts respectively. You are free to invest some tokens in the private account and some in the public account. Alternatively, you can invest all of your tokens in the private account or all of them in the public account.

You are only allowed to invest an integer number (whole number) in the private and public accounts and so you cannot choose to invest 15.5 tokens for example. Also, please make sure that your investment in the private account plus your investment in the public account equals the total number of tokens you have (750 tokens).

Number of tokens you like to invest in private account: _______________

Number of tokens you like to invest in public account: _______________

Once you have made your decision please press the continue button below.

SCREEN 7: Decision Input – Real Round

This is round 1 of the 10 real rounds. The decisions you make in the real rounds are **NOT** hypothetical. At the end of the experiment, one of the real rounds will be randomly chosen as binding. You will be paid based on your earnings in the binding round.

In the two boxes below, please enter the number of tokens you would like to invest in the private and public accounts respectively. You are free to invest some tokens in the private account and some in the public account. Alternatively, you can invest all of your tokens in the private account or all of them in the public account.

You are only allowed to invest an integer number (whole number) in the private and public accounts and so you cannot choose to invest 15.5 tokens for example. Also, please make sure that your investment in the private account plus your investment in the public account equals the total number of tokens you have (750 tokens).

Number of tokens you like to invest in private account: _______________

Number of tokens you like to invest in public account: _______________

Once you have made your decision please press the continue button below.

SCREEN 8: Outcome

The number of tokens you invested in the private account _________

The number of tokens you invested in the public account. _________

Total number of tokens invested by your group in the public account _________

Your payoff from the private account _________

Your payoff from the public account _________

Your total payoff for this round _________

This concludes period XXX. Please press the continue button below to advance to the next period.

SCREEN 9: Next Period Intro

Before we start period XXX please remember the following:

- The composition of your group changes every period. Each period, you are randomly reassigned to a new group of 4 members.
- You have 750 tokens available each period and you have to decide how to divide those tokens between the private and public accounts.
- Every dollar invested in the private account yields one cent only to the person who invested it
- Every dollar invested in the public account yields half a cent to every member in the group.

Please raise your hand if you have any questions, otherwise please press the continue button below.

A2. Theoretical Model of High-Income Individuals:

This section applies similar reasoning to the one adopted in the theoretical framework section to explain potential changes in the behavior of high-income individuals resulting from the introduction of heterogeneity in income and relative return. The payoff of a high-income individual playing in a separated income group can be written as:

$$u_i^R = (w_i^R - g_i^R) + a g_i^R + a \sum_{j=1}^{3} g_j^R(\bar{g}) \tag{33}$$

while his payoff when in a mixed income group is given by

$$v_i^R = (w_i^R - g_i^R) + a g_i^R + a\gamma g_j^R(\bar{g}) + a\delta \sum_{k=1}^{2} g_k^P(\bar{g}). \tag{34}$$

Hence, we can represent the change is his payoff if he increases his contribution from g_{oi}^{R} in the separated income group and g_{Hi}^{R} in the mixed income group by the following equation:

$$\Delta u_i^R = \left(g_{oi}^R - g_{Hi}^R\right) + a\left(g_{Hi}^R - g_{oi}^R\right) + a\left[\gamma g_j^R(\bar{g}_H) - g_j^R(\bar{g}_o)\right] + a[\delta \sum_{k=1}^{2} g_k^P(\bar{g}_H) - \sum_{l=1}^{2} g_l^R(\bar{g}_o)] \quad (35)$$

Similarly, the change in his payoff if he/she decreases his contribution from g_{Mi}^{R} to g_{Li}^{R} is given by:

$$\Delta u_i^R = \left(g_{oi}^R - g_{Li}^R\right) + a\left(g_{Li}^R - g_{oi}^R\right) + a\left[\gamma g_j^R(\bar{g}_L) - g_j^R(\bar{g}_o)\right] + a\left[\delta \sum_{k=1}^{2} g_k^P(\bar{g}_L) - \sum_{l=1}^{2} g_l^R(\bar{g}_o)\right] \quad (26)$$

while the change in his payoff resulting from a no change in contribution can be written as:

$$\Delta u_i^R = a\left[\gamma g_j^R(\bar{g}_o) - g_j^R(\bar{g}_o)\right] + a[\delta \sum_{k=1}^{2} g_k^P(\bar{g}_o) - \sum_{l=1}^{2} g_l^R(\bar{g}_o)]. \quad (27)$$

Given the above equation, we can follow the same thought process presented in the theoretical framework section to reach similar hypotheses regarding the behavior of high-income individuals.

APPENDIX B

B1. Experimental Instructions for the Dictator Game Experiment

These instructions were presented in paper for to the subjects. The instructions differed based on the treatment.

Introductory Instructions

Welcome! Thank you for participating in today's session!

You will receive a $5 show-up fee for your participation in this experiment. You may receive additional payments depending on the outcomes of the experiment.

When you entered the room you received this packet of information. To aid in identification, your ID number for the experiment is written in the upper right-hand corner of each sheet. The use of identification numbers ensures individual confidentiality. As a reminder before we start today's session, your participation is completely voluntary. At any time, you may elect to end your participation. However, in order to receive any monetary payments, you must complete the whole session. All information collected today will be kept confidential and will not be used for any purpose other than this research.

Before you begin, please make sure that your cellphone is turned off and all of your belongings are placed beside you on the floor. Please remain quiet and keep your eyes on your paper for the duration of the experiment. We expect and appreciate your cooperation.

All of the instructions you will need are written in this packet. If you have any questions at any point in time, please raise your hand and a session monitor will come to assist you.

Die-Roll Task (Fake Entitlement Treatment)

In this part of the experiment, you are required to make one die roll. Your goal is to get the highest number. The outcome of the next part of the experiment depends on your performance here, so the higher the number you get in your die roll the better. You will have two choices to make as follows: First, you will choose from 4 different dice the one you would like to play with. The four dice are as follows:

1. Large Die
2. Medium Die
3. Small Die
4. Extra Small Die

Please circle the die that you would like to roll.

Second, you will choose from the following 2 options where you would like to roll you die:

1. Open Space (the desk in front of you)
2. Closed Space (a small box will be provided)

Please circle the option you prefer.

When you are done choosing which die you want to roll and where you would like to roll it, please wait for a session monitor to provide you with the preferred die and rolling space. This might take a few minutes so please be patient.

After you are done rolling, please stay seated and remain quiet. The session monitor will provide you with further instructions shortly. We expect and appreciate your cooperation.

General Knowledge Quiz (Real Entitlement Treatment)

In this part of the experiment, you will have 10 minutes to answer 10 general knowledge questions. Your goal is to correctly answer as many questions as you can. The outcome of the next part of this experiment depends on your performance here, so the higher the number of correct answers you get the better.

You may not use any external sources (like books, phone, internet, etc.) for help when attempting to answer those questions.

Please circle your answer clearly for each of the questions below.

1. Grand Central Terminal, Park Avenue, New York is the world's
    a. Largest railway station
    b. Highest railway station
    c. Longest railway station
    d. None of the above

2. Entomology is the science that studies
    a. Behavior of human beings
    b. Insects
    c. The origin and history of technical and scientific terms
    d. The formation of rocks

3. Eritrea, which became the 182^{nd} member of the UN in 1993, is in the continent of
    a. Asia
    b. Africa
    c. Europe

d. Australia

4. Exposure to sunlight helps a person improve his health because

    a. The infrared light kills bacteria in the body
    b. Resistance power increases
    c. The pigment cells in the skin get stimulated and produce a healthy tan
    d. The ultraviolet rays convert skin oil into Vitamin D

5. Each year World Red Cross and Red Crescent Day is celebrated on

    a. May 8
    b. May 18
    c. June 8
    d. June 18

6. Federation Cup, World Cup, Allywyn International Trophy, and Challenge Cup are awarded to winners of

    a. Tennis
    b. Volleyball
    c. Basketball
    d. Cricket

7. Germany signed the Armistice Treaty on ______ and World War I ended

    a. January 19, 1918

    b. May 30, 1918

    c. November 11, 1918

    d. February 15, 1918

8. The Ozone layer restricts

    a. Visible light

    b. Infrared radiation

    c. X-rays and gamma rays

    d. Ultraviolet radiation

9. Headquarters of UNO are situated at

    a. New York, USA

    b. Hague, Netherlands

    c. Geneva, Switzerland

    d. Paris, France

10. During the first crusade, crusaders reached Jerusalem and captured it in

    a. 1000 AD

    b. 1200 AD

    c. 1099 AD

    d. 1515 AD

When you are done, please wait for a session monitor to come and collect your sheet. After that, the session monitor will be back shortly with further instructions. This may take a few minutes so please be patient and stay seated. Also, please remain quiet and do not speak with any of the participants. We expect and appreciate your cooperation.

Decision-Making Task – Control Group – Decision-Makers

In this experiment, you have been randomly paired with another participant in ***another*** room. You will not be told who you were matched with during or after the experiment, nor will he/she be told who they were matched with during or after the experiment. That is, the pairs will remain anonymous to one another. Most importantly, your decisions will be strictly anonymous and cannot be linked to you in any way.

Based on a random, 50/50 chance lottery you were selected to participate as the decision maker in this game, which means that the person you were matched with will participate as the receiver. Aside from the $5 show-up fee that each of you will be given for participating in this experiment, you have been endowed with an additional $10. However, the person you were matched with (the receiver) has not been endowed with an additional $10.

Your decision is simple: decide what portion of this $10, if any, you would like to transfer to the person you were matched with (the receiver). Your choice can be anywhere from $0 to $10 in $0.5 increments. Your take-home earnings from this experiment will be the sum of your $5 show-up fee and the money you decide to keep for yourself out of this additional $10 endowment. Similarly, the take-home earnings of the person you were matched with (the receiver) will be the sum of his $5 show-up fee and the money you decided to transfer to him out of the additional $10 endowment.

You have 5 minutes to come up with a decision about your choice. Please do not talk to any participants before the session is over. Also, do not be concerned if others in the room finish before you, we will not collect the forms until after 5 minutes.

Please raise your hand if you have any questions or need further explanation. Otherwise, please circle your transfer below:

$0	$0.50	$1	$1.5	$2	$2.5	$3
$3.5	$4	$4.5	$5	$5.5	$6	$6.5
$7	$7.5	$8	$8.5	$9	$9.5	$10

Once you are done, please stay seated and remain quiet. A session monitor will come to collect your form and hand you further instructions.

Decision-Making Task – Control Group – Receivers

In this experiment, you have been randomly paired with another participant in *another* room. You will not be told who you were matched with during or after the experiment, nor will he/she be told who they were matched with during or after the experiment. That is, the pairs will remain anonymous to one another. Most importantly, your decisions will be strictly anonymous and cannot be linked to you in any way.

Based on a random, 50/50 chance lottery you were selected to participate as the receiver in this experiment, which means that the person you were matched with will participate as the decision maker. Aside from the $5 show-up fee that each of you will be given for participating in this experiment, the person you were matched with (the decision maker) has been endowed with an additional $10. However, you have not been endowed with this additional $10.

The decision maker will decide what portion of his $10 endowment, if any, he would like to transfer to you. He can choose anywhere from $0 to $10 in $0.5 increments. Your take-home earnings from this experiment will be the sum of your $5 show-up fee and the amount of money the decision maker decides to transfer to you out of his additional $10 endowment. Similarly, his take-home earnings from this experiment will be the sum of his $5 show-up fee and the amount of money he chooses to keep for himself out of the additional $10 endowment.

Your task is simple: you will have to choose how much you expect the decision maker will transfer to you out of his additional $10 endowment.

You have 5 minutes to come up with a decision about your choice. Please do not talk to any participants before the session is over. Also, do not be concerned if others in the room finish before you, we will not collect the forms until after 5 minutes.

Please raise your hand if you have any questions or need further explanation. Otherwise, please circle your choice below:

$0	$0.50	$1	$1.5	$2	$2.5	$3
$3.5	$4	$4.5	$5	$5.5	$6	$6.5
$7	$7.5	$8	$8.5	$9	$9.5	$10

Once you are done, please stay seated and remain quiet. A session monitor will come to collect your form and hand you further instructions.

Decision-Making Task – Fake Entitlement – Decision-Makers

You have been randomly paired with another participant in *another* room. You will not be told who you were matched with during or after the experiment, nor will he/she be told who they were matched with during or after the experiment. That is, the pairs will remain anonymous to one another. Most importantly, your decisions will be strictly anonymous and cannot be linked to you in any way.

Based on the results of the die roll in the previous part of the experiment, one of you will be assigned the role of the decision-maker while the other will be assigned the role of the receiver. The person you are matched with has also made decisions about which die he would like to roll and where he would like to roll his die. The person who rolled the higher number will act as the decision maker and the one who rolled the lower number will act as the receiver. Since you rolled a _____ and the person you are matched with rolled a _____, you have been selected to participate as the decision maker in this experiment, which means that the person you are matched with will participate as the receiver. Aside from the $5 show-up fee that each of you will be given for participating in this experiment, you have been endowed with an additional $10. However, the person you were matched with (the receiver) has not been endowed with an additional $10.

Your decision is simple: decide what portion of this $10, if any, you would like to transfer to the person you were matched with (the receiver). Your choice can be anywhere from $0 to $10 in $0.5 increments. Your take-home earnings from this experiment will be the sum of the $5 show-up fee and the money you decide to keep for yourself out of this additional $10 endowment. Similarly, the take-home earnings of the person you were matched with (the receiver) will be the sum of his $5 show-up fee and the money you decided to transfer to him out of the additional $10 endowment.

You have 5 minutes to come up with a decision about your choice. Please do not talk to any participants before the session is over. Also, do not be concerned if others in the room finish before you, we will not collect the forms until after 5 minutes.

Please raise your hand if you have any questions or need further explanation. Otherwise, please circle your transfer below:

$0	$0.50	$1	$1.5	$2	$2.5	$3
$3.5	$4	$4.5	$5	$5.5	$6	$6.5
$7	$7.5	$8	$8.5	$9	$9.5	$10

Once you are done, please stay seated and remain quiet. A session monitor will come to collect your form and hand you further instructions.

Decision-Making Task – Fake Entitlement – Receivers

You have been randomly paired with another participant in *another* room. You will not be told who you were matched with during or after the experiment, nor will he/she be told who they were matched with during or after the experiment. That is, the pairs will remain anonymous to one another. Most importantly, your decisions will be strictly anonymous and cannot be linked to you in any way.

Based on the results of the die roll in the previous part of the experiment, one of you will be assigned the role of the decision-maker while the other will be assigned the role of the receiver. The person you are matched with has also made decisions about which die he would like to roll and where he would like to roll his die. The person who rolled the higher number will act as the decision maker and the one who rolled the lower number will act as the receiver. Since you rolled a _____ and the person you are matched with rolled a _____, you have been selected to participate as the receiver in this experiment, which means that the person you are matched with will participate as the decision-maker. Aside from the $5 show-up fee that each of you will be given for participating in this experiment, the person you were matched with (the decision maker) has been endowed with an additional $10. However, you have not been endowed with this additional $10.

The decision maker will decide what portion of his $10 endowment, if any, he would like to transfer to you. He can choose anywhere from $0 to $10 in $0.5 increments. Your take-home earnings from this experiment will be the sum of your $5 show-up fee and the amount of money the decision maker decides to transfer to you out of his additional $10 endowment. Similarly, his take-home earnings from this experiment will be the sum of his $5 show-up fee and the amount of money he chooses to keep for himself out of the additional $10 endowment.

Your task is simple: you will have to choose how much you expect the decision maker will transfer to you out of his additional $10 endowment.

You have 5 minutes to come up with a decision about your choice. Please do not talk to any participants before the session is over. Also, do not be concerned if others in the room finish before you, we will not collect the forms until after 5 minutes.

Please raise your hand if you have any questions or need further explanation. Otherwise, please circle your choice below:

$0	$0.50	$1	$1.5	$2	$2.5	$3
$3.5	$4	$4.5	$5	$5.5	$6	$6.5
$7	$7.5	$8	$8.5	$9	$9.5	$10

Once you are done, please stay seated and remain quiet. A session monitor will come to collect your form and hand you further instructions.

Decision-Making Task – Real Entitlement – Decision-Makers

You have been randomly paired with another participant in *another* room. You will not be told who you were matched with during or after the experiment, nor will he/she be told who they were matched with during or after the experiment. That is, the pairs will remain anonymous to one another. Most importantly, your decisions will be strictly anonymous and cannot be linked to you in any way.

Based on the results of the knowledge quiz in the previous part of the experiment, one of you will be assigned the role of the decision-maker while the other will be assigned the role of the receiver. The person you are matched with has answered the exact same questions as you. The person with more correct answers will act as the decision-maker and the one with less correct answers will act as the receiver. Since you had _____ correct answers and the person you were matched with had _____ correct answers, you have been selected to participate as the decision-maker, which means that the person you were matched with will participate as the receiver. Aside from the $5 show-up fee that each of you will be given for participating in this experiment, you have been endowed with an additional $10. However, the person you were matched with (the receiver) has not been endowed with an additional $10.

Your decision is simple: decide what portion of this $10, if any, you would like to transfer to the person you were matched with (the receiver). Your choice can be anywhere from $0 to $10 in $0.5 increments. Your take-home earnings from this experiment will be the sum of your $5 show-up fee and the money you decide to keep for yourself out of this additional $10 endowment. Similarly, the take-home earnings of the person you were matched with (the receiver) will be the sum of his $5 show-up fee and the money you decided to transfer to him out of the additional $10 endowment. You have 5 minutes to come up with a decision about your choice. Please do not talk to any participants before the session is over. Also, do not be concerned if others in the room finish before you, we will not collect the forms until after 5 minutes.

Please raise your hand if you have any questions or need further explanation. Otherwise, please circle your transfer below:

$0	$0.50	$1	$1.5	$2	$2.5	$3
$3.5	$4	$4.5	$5	$5.5	$6	$6.5
$7	$7.5	$8	$8.5	$9	$9.5	$10

Once you are done, please stay seated and remain quiet. A session monitor will come to collect your form and hand you further instructions.

Decision-Making Task – Real Entitlement – Receivers

You have been randomly paired with another participant in *another* room. You will not be told who you were matched with during or after the experiment, nor will he/she be told who they were matched with during or after the experiment. That is, the pairs will remain anonymous to one another. Most importantly, your decisions will be strictly anonymous and cannot be linked to you in any way.

Based on the results of the knowledge quiz in the previous part of the experiment, one of you will be assigned the role of the decision-maker while the other will be assigned the role of the receiver. The person you are matched with has answered the exact same questions as you. The person with more correct answers will act as the decision-maker and the one with less correct answers will act as the receiver. Since you had _____ correct answers and the person you were matched with had _____ correct answers, you have been selected to participate as the receiver, which means that the person you were matched with will participate as the decision-maker. Aside from the $5 show-up fee that each of you will be given for participating in this experiment, the person you were matched with (the decision maker) has been endowed with an additional $10. However, you have not been endowed with this additional $10.

The decision maker will decide what portion of his $10 endowment, if any, he would like to transfer to you. He can choose anywhere from $0 to $10 in $0.5 increments. Your take-home earnings from this experiment will be the sum of your $5 show-up fee and the amount of money the decision maker decides to transfer to you out of his additional $10 endowment. Similarly, his take-home earnings from this experiment will be the sum of his $5 show-up fee and the amount of money he chooses to keep for himself out of the additional $10 endowment.

Your task is simple: you will have to choose how much you expect the decision maker will transfer to you out of his additional $10 endowment.

You have 5 minutes to come up with a decision about your choice. Please do not talk to any participants before the session is over. Also, do not be concerned if others in the room finish before you, we will not collect the forms until after 5 minutes.

Please raise your hand if you have any questions or need further explanation. Otherwise, please circle your choice below:

$0	$0.50	$1	$1.5	$2	$2.5	$3
$3.5	$4	$4.5	$5	$5.5	$6	$6.5
$7	$7.5	$8	$8.5	$9	$9.5	$10

Once you are done, please stay seated and remain quiet. A session monitor will come to collect your form and hand you further instructions.

APPENDIX C

C1. Experimental Instructions for Risk Preference Experiment

Those instructions were computerized using iMotions software. The order of the slides was changed depending on the treatment.

Screen 1 – Diluted Group

Welcome!

Thank you for participating in today's session. The session will proceed in several stages as follows:

Stage 1: Video

Stage 2: Survey 1

Stage 3: Choice Task 1

Stage 4: Choice Task 2

Stage 5: Survey 2

Stage 6: Receive Payment

Press <Enter> to continue…

Screen 1 – Undiluted Group

Welcome!

Thank you for participating in today's session. The session will proceed in several stages as follows:

Stage 1: Video

Stage 2: Choice Task 1

Stage 3: Choice Task 2

Stage 4: Survey 1

Stage 5: Survey 2

Stage 6: Receive Payment

Press <Enter> to continue…

Screen 2

Video

This stage will proceed as follows:

1. You will watch a video of approximately 5 minutes of duration
2. You are required to pay close attention to the video
3. You will automatically proceed to the next stage once the video is over

Press <Enter> to continue…

Screen 3

Survey 1

This stage will proceed as follows:

1. You will be presented with questions regarding your current state of mind
2. For each question, you will rate how strongly you are currently feeling the specific state of mind
3. You will answer on a scale of 1 to 5 (1=very slightly or not at all, 5=extremely)

Press <Enter> to continue…

Screen 4

How “happy” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 5

How “amused” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 6

How “distressed” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 7

How “excited” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 8

How “upset” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 9

How “strong” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 10

How “guilty” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 11

How “angry” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 12

How “hostile” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 13

How “enthusiastic” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 14

How “proud” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 15

How “irritable” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 16

How "sad" do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 17

How "ashamed" do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 18

How "interested" do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 19

How "nervous" do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 20

How “determined” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 21

How “attentive” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 22

How “jittery” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 23

How “active” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 24

How “afraid” do you currently feel?

1	2	3	4	5
(very slightly or not at all)	(a little)	(moderately)	(quite a bit)	(extremely)

Screen 25

Choice Task 1

This stage will proceed as follows:

- You will be presented with a series of 10 choices
- Each choice contains two alternatives (A and B)
- Each alternative is a lottery that pays one of two possible outcomes
- You have to choose the alternative you prefer from each choice set
- There is no right or wrong answer, you simply have to choose the alternative you prefer
- This task might be chosen at the end of the experiment as binding.
- If this is the binding task, one of the 10 choice sets will be randomly chosen and you will be paid based on the outcome of the alternative you chose in this choice set
- Press <Enter> to continue…

Screen 26

Alternative A	Alternative B
▪ 10% chance to get $2	▪ 10% chance to get $3.85
and	and
▪ 90% chance to get $1.6	▪ 90% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 27

Alternative A	Alternative B
▪ 20% chance to get $2	▪ 20% chance to get $3.85
and	and
▪ 80% chance to get $1.6	▪ 80% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 28

Alternative A	Alternative B
▪ 30% chance to get $2	▪ 30% chance to get $3.85
and	and
▪ 70% chance to get $1.6	▪ 70% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 29

Alternative A	Alternative B
▪ 40% chance to get $2	▪ 40% chance to get $3.85
and	and
▪ 60% chance to get $1.6	▪ 60% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 30

Alternative A	Alternative B
▪ 50% chance to get $2	▪ 50% chance to get $3.85
and	and
▪ 50% chance to get $1.6	▪ 50% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 31

Alternative A	Alternative B
▪ 60% chance to get $2	▪ 60% chance to get $3.85
and	and
▪ 40% chance to get $1.6	▪ 40% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 32

Alternative A	Alternative B
▪ 70% chance to get $2 and ▪ 30% chance to get $1.6	▪ 70% chance to get $3.85 and ▪ 30% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 33

Alternative A	Alternative B
▪ 80% chance to get $2 and ▪ 20% chance to get $1.6	▪ 80% chance to get $3.85 and ▪ 20% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 34

Alternative A	Alternative B
▪ 90% chance to get $2	▪ 90% chance to get $3.85
and	and
▪ 10% chance to get $1.6	▪ 10% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 35

Alternative A	Alternative B
▪ 100% chance to get $2	▪ 100% chance to get $3.85
and	and
▪ 0% chance to get $1.6	▪ 0% chance to get $0.1

Which alternative do you prefer?

Alternative A

Alternative B

Screen 36

This stage will proceed as follows:

1. You will be presented with a choice set containing 6 alternatives.
2. Each alternative is a 50/50 lottery that pays one of two outcomes.
3. You have to choose the alternative you prefer from this set.
4. There is no right or wrong answer, you simply have to choose the alternative you prefer.
5. This task might be chosen at the end of the experiment as binding.
6. If this is the binding task, then you will play the lottery you chose and you will be paid based on the outcome of that lottery.

Screen 37

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
▪ 50% chance to get $5.60	▪ 50% chance to get $4.80	▪ 50% chance to get $4.00	▪ 50% chance to get $3.20	▪ 50% chance to get $2.40	▪ 50% chance to get $0.40
and	and	and	and	and	and
▪ 50% chance to get $5.60	▪ 50% chance to get $7.20	▪ 50% chance to get $8.80	▪ 50% chance to get $10.40	▪ 50% chance to get $12.00	▪ 50% chance to get $14.00

Screen 38

Thank you for your participation!

Please wait for a session monitor for further instruction

C2. Holt-Laury Decisions Using Overall Sample of Participants

Table C-1. Summary of Choices in Holt-Laury Task by Dilution Group – Overall Sample

Safe Choices	Implied CRRA Range	Fraction of Choices (%) Dilution			Fraction of Choices (%) No Dilution		
		Neutral (n=30)	Positive (n=30)	Negative (n=29)	Neutral (n=32)	Positive (n=33)	Negative (n=31)
0	r < -1.71	0.00	0.00	3.45	6.25	12.12	0.00
1	-1.71 < r < -0.95	0.00	3.33	0.00	3.125	0.00	0.00
2	-0.95 < r < -0.49	3.33	10.00	3.45	6.25	0.00	3.23
3	-0.49 < r < -0.14	3.33	16.67	10.34	12.5	18.18	16.13
4	-0.14 < r < 0.15	16.67	20.00	17.24	21.875	18.18	22.58
5	0.15 < r < 0.41	10.00	16.67	6.90	9.375	6.06	9.68
6	0.41 < r < 0.68	23.33	16.67	27.59	12.5	12.12	19.35
7	0.68 < r < 0.97	23.33	6.67	20.69	15.625	3.03	9.68
8	0.97 < r < 1.37	10.00	3.33	6.90	12.5	24.24	12.90
9-10	1.37 < r	10.00	6.67	3.45	0	6.06	6.45

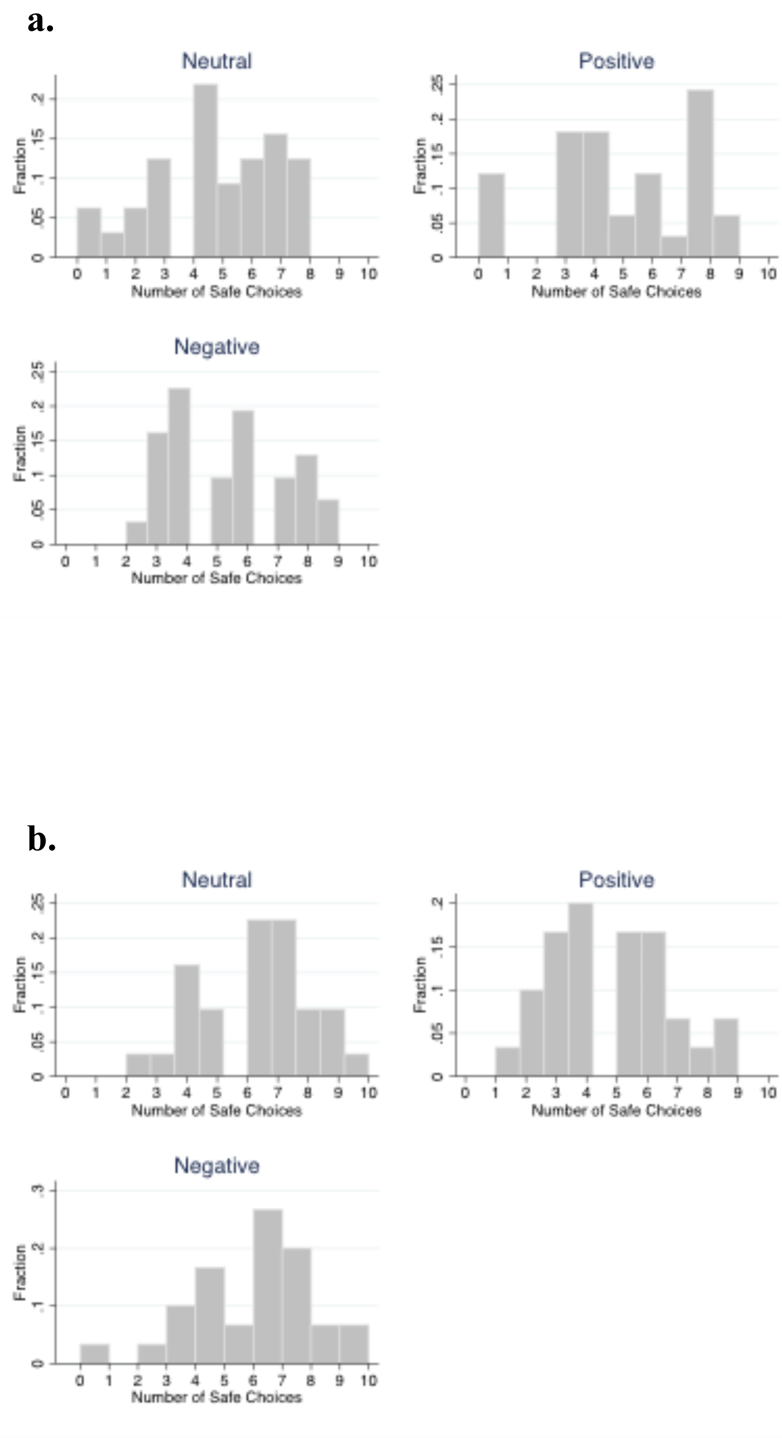

Figure C-1. Histogram of Choices in HL Task – Overall Sample. (a) Diluted Group. (b) Undiluted Group.